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Papers on semantic theory and research include: "Presupposition, Congruence, and Adverbs of Quantification" (Mike Calcagno); "A Unified Account of '(Ta)myen'-Conditionals in Korean" (Chan Chung); "Spanish 'imperfecto' and 'preterito': Truth Conditions and Aktionsart Effects in a Situation Semantics" (Alicia Cipria, Craige Roberts); "Remarks on Simple Subjunctives" (Andreas Kathol); "Information Structure in Discourse: Towards an Integrated Formal Theory of Pragmatics" (Roberts); "Interpretation of Korean Temporal Markers -ESS and -NUN" (Eun Jung Yoo); and "Interpretation of Relative Tenses in Korean Time Adverbials" (Jae-Hak Yoon). Articles contain references. (MSE)

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Summer 1996

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Working Papers in Linguistics No. 49

Papers in Semantics

Edited by

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Summer 1996

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A Note from the Editors

This volume is a special issue containing a sampling of research by graduate students and faculty of the Department of Linguistics at the Ohio State University. Several authors have graduated since submitting their papers. This volume is devoted to works in Semantics, including works on modality (Chan Chung and Andreas Kathol), tense and aspect (Alicia Cipria & Craige Roberts, Eun Jung Yoo, and Jae-Hak Yoon), the information structure and adverbs of quantification (Craige Roberts and Mike Calcagno).

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11

Ohio State University Working Papers in Linguistics No. 49

Papers in Semantics

Table of Contents

Information concerning OSUWPL ..... iii-vi

Information concerning OSDL ..... vii-viii

A Note from the Editors ix

Table of Contents xi

Mike Calcagno — Presupposition, Congruence and Adverbs of Quantification 1

Chan Chung — A Unified Account of *(Ta)myen*-Conditionals in Korean 25

Alicia Cipria and Craige Roberts — Spanish *imperfecto* and *pretérito*: Truth conditions and aktionsart effects in a Situation Semantics 43

Andreas Kathol — Remarks on Simple Subjunctives 71

Craige Roberts — Information Structure in Discourse: Towards an Integrated Formal Theory of Pragmatics 91

Eun Jung Yoo — Interpretation of Korean Temporal Markers *-ESS* and *-NUN* 137

Jae-Hak Yoon — Interpretation of Relative Tenses in Korean Time Adverbials 159

OSU Working Papers in Linguistics 49, 1-23

Presupposition, Congruence and Adverbs of Quantification

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1 Preliminaries

This paper assumes, along with many others, including Barwise and Cooper (1981), Stump (1981, 1985), Chierchia (1988, 1990), Schwarzschild (1989), and de Swart (1994), that adverbs of quantification (the boldface elements in (1), also called Q-adverbs) are generalized quantifiers, and attempts to make explicit the process by which the domain of these quantifiers is computed.

(1) a. Jan **often** butters her bread.

b. Peter **usually** goes to the theater if he is town.

c. Bobby **always** shaves when he showers.

d. Marcia **sometimes** buys TURKISH coffee.

Now, the example in (1a) (probably) does not mean that on most occasions (morning, noon or night) we can expect to find Jan buttering her bread. Rather, its meaning can be roughly paraphrased by something like (2), where an explicit clause is taken to provide some restriction on the domain of quantification.

[1]This is a work in progress and as such any comments would be greatly appreciated. The material herein would undoubtedly be much worse without the help and comments of Peter Culicover, Christian Imerhoffer, Louise McNally, Junko Tsunaki, Svetlana Vasina and, especially, Craige Roberts. These people, of course, should not be held responsible for any remaining errors. This work also owes an obvious debt to von Fintel (1995), a draft of which I received while preparing this manuscript. Although our proposals differ in the end, they are in the same spirit, and he identified and solved many problems for me.

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(2) When Jan has bread and is going to eat it, she often butters it.

Similarly, the quantifiers in (1b)-(1d) also involve domain restriction. In (1b), *usually* seems to range only over situations in which Peter is in town. (1c) has (at least) two readings, paraphrased in (3a) and (3b); and (1d), with intonational prominence indicated in all capital letters and thus on the word *Turkish*, can be taken to mean something like (3c).

(3) a. When Bobby shaves, he is always showering.

b. When Bobby is in the shower, he always shaves.

c. When Marcia buys coffee, she sometimes buys Turkish coffee.

As von Fintel (1995) notes, "considerable machinery" has been proposed recently to derive the correct restriction in cases like those above. For example, Rooth (1985, 1991/5), Krifka (1992) and Partee (1991) propose that focused material is mapped into an explicit restrictive clause in a tripartite structure at the level of LF. Diesing (1990, 1992) and Johnston (1994) map VP external material into a similar LF structure, while Berman (1990) and Chierchia (1992, 1994) also assume the existence of a tripartite representation at the level of syntax/semantics, to be filled by material presupposed by the nuclear scope and topics, respectively.

I will instead argue, along with von Fintel and in keeping with recent work by Roberts (1991), Rooth (1992) and Schwarzschild (1993), that the determination of these quantifiers' restrictions is **pragmatic**. More concretely, I will propose that a pragmatic theory of **information structure** like that proposed by Roberts (1995) leads naturally to a unified, presupposition-based account of domain restriction, in which operators of this type range freely over a set of situations "under discussion" at a given place in discourse. The account differs from that of von Fintel (1995) in that it does not appeal to any relation between a sententially-introduced anaphoric element and a set of "discourse topics." Rather, I provide an account based on the otherwise-motivated relations of **congruence** and **presupposition satisfaction** and show that an approach of this type can more adequately deal with a range of data that includes examples that have heretofore been problematic for the "anaphoric" accounts mentioned above.

2 Theoretical Background

2.1 A Structured Context

I am going to assume a theory of context along the lines of Roberts (1995), which in turn is an enrichment of the ideas of Stalnaker (1979) and Carlson (1983).[2] The key idea will be that discourse is organized around a series of conversational goals, and that the primary goal of discourse is communal inquiry. That is, participants in a discourse are attempting to share with each other information about the world, and they go about this undertaking by addressing implicit and explicit questions. The

[2] This brief introduction will, without doubt, do injustices to just about everyone involved in this line of research. Readers are strongly encouraged to dig up Roberts (1995) for a more complete introduction.

information that interlocutors share (or behave as if they believe to be true) can be modelled, as in Stalnaker (1979), as a set of propositions known as the **common ground**. Assuming Kratzer's (1989) version of situation semantics, in which situations are parts of possible worlds, we will take propositions to be sets of situations. The common ground, in turn, will be a set of sets of situations that the interlocutors take to hold. The intersection of the common ground, Stalnaker's **context set**, is also a useful notion. Intuitively, this set will be the set of situations where all the propositions in the common ground are true. That is, assuming that the interlocutors are rational and so forth, the context set is a set of candidate situations for reality. The goal of discourse can be stated in terms of the context set as follows: interlocutors try to reduce the context set to a singleton; that is, they try to find the possible world (which is just a large-enough situation) that captures the way things are.

The exchange of information itself is modelled by a set of **moves**, of which there are two types. Questions count as what Carlson would call *setup moves*; assertions can be thought of as *payoff moves*. As the terms suggest, these moves come in pairs: a question is asked (set-up) and an assertion answers (payoff). On the surface, it may seem absurd to claim that discourse proceeds in this way. That is, we can think of many dialogues in which an assertion is made out of the blue, or in which a series of questions is asked with no assertions in between. I would suggest, however, that in the former case, the assertion comes as answer to an implicit question, which can be inferred by various cues and is at the very least an answer to the "Big Question" (*What is the way things are?*). In the latter case, it is merely that the interlocutors are enumerating a plan to answer some larger question by a series of sub-questions, and that these sub-questions are answered one at a time in the order in which they are accepted. For example, suppose that Carol and Mike are cleaning up in the aftermath of a wild party and wish to answer the question *Who drank what?*. They may attempt to answer this by addressing the sub-questions *What did Bobby drink?*, *What did Peter drink?*, *What did Greg drink?* and so forth. Note that answers to all the sub-questions would provide an answer to the large question, and note also that each of the sub-questions need not be explicitly asked (i.e., realized as a speech act). What is important is simply that both interlocutors can figure out that these are the questions being addressed, and that they are answered one at a time.[1]

So what exactly is a move? Well, we first note that moves are essentially semantic entities and that a given move can be interpreted in two dimensions. That is, with each move we will associate with it **presupposed content** and **proferred content**.[2] Proferred content is what is asserted in an assertion, and the non-presupposed content of questions. In terms of the goals we have alluded to before, question moves are a type of imperative which profer a set of alternatives and dictate that the interlocutors choose among them. More specifically, the alternatives determined by a question can be taken to be the set of propositions which are the possible answers to the question. Another way of viewing these proferred alternatives, suggested by Groenendijk & Stokhof (1984), is this: a question partitions the context set into sets of worlds in which one complete answer to the question is true. For example, the question *Where did Robin go last Thursday?* will partition the context set into sets of worlds where, for example, Robin went to Greece last Thursday, Robin went to Turkey last Thursday,

[1] See Roberts (1995) and below for more discussion of these issues.

[2] The terms here, like those in much of this section, are Roberts'.

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Robin went to Italy last Thursday and so forth. Assertions, in turn, simply denote propositions in the traditional sense and shrink the context set by selecting from the partitions proferred by the question to which the assertion is a complete answer. To continue our simple example, the assertion *Robin went to GREECE last Thursday* will pick out in the context set all and only those worlds in which it was Greece where Robin went last Thursday, as opposed to Italy or Turkey or some other place. The mechanism by which it does this is quite straightforward. If an assertion is accepted by the interlocutors in a discourse, it is simply added to the common ground, with the desired shrinking of the context set following by definition.

2.2 Presupposition, Questions and Congruence

Language is a cooperative undertaking and it is in the best interest of the interlocutors in a given discourse to be as explicit as possible about what they believe to be the propositions in the common ground and what they believe to be the current question being addressed, which from now on we will refer to as the **question under discussion**. On the other hand, if we had to enumerate explicitly everything we believed to be true about the world before, for example, asking whether or not there was milk in the refrigerator, we would expect language to be a quite cumbersome and inefficient means of gathering information. It is not.

Rather, it has been argued that a number of conventional "tricks" are available to participants in a given discourse that can be used to indicate to other participants what is believed to be, for example, the question under discussion or other information in the common ground. By using these tricks, we can keep the discourse coherent in crucial respects without having to waste a lot of time asking obvious questions or providing background information.

In light of the goals and structure of discourse sketched above, presupposition is certainly used for this purpose in the sense that it enables interlocutors to make sure they are considering sets of situations that are similar in crucial respects, i.e., with respect to the information in the common ground. That is, if we adopt a notion of presupposition akin to Stalnaker's (1979) or Heim's (1983, 1992), made explicit in (4), it follows that the set of candidate situations at any given point (which we have been calling the context set) will have to be a subset of the set of situations in any presupposition. If a situation is in the context set, however, it must belong to all the propositions in the common ground. Hence, any presupposition would also have to be in or be entailed by the propositions in the common ground.

(4) An utterance ϕ presupposes proposition p iff ϕ is felicitous in any given context c only when $c \models p$.

Of course, interlocutors come into every exchange with different information about the world, so isn't it unreasonable to expect that every presupposition in a given discourse will be in the set of propositions that the participants all believe to be true? Well, yes, but in general this does not cause the discourse to grind to a halt. As Roberts (1995:10-11) puts it: "If an utterance has a conventionally expressed presupposition, it is often quite clear what the context should be like in order for it to be felicitous. And if the context isn't quite like that but the hearer is cooperative and has no objection to the truth of the presupposed information, he will accommodate it — behave as if the context included that information all along."

The notion of presupposition can also be used to explain why certain utterances are felicitous answers to certain questions while others are not. Consider, for example, the question in (5) and the answers in (6).

(5) Where did Marcia go last year?

(6) a. Marcia went to GREECE last year.

b. #MARCIA went to Greece last year.

c. #Marcia went to Greece last YEAR.

d. #Marcia went to Greece LAST year.

It is clear that, speaking just on an intuitive level at this point, that the utterance in (6a) felicitously answers (5) while the utterances in (6b)-(6d) seem to be infelicitous in this context, or to answer some other questions. It is also the case that (6a)-(6d) differ only in the placement of prosodic focus (indicated again by capital letters).

The facts above can be explained, it seems, if we assume (like Rooth (1985,1992), von Stechow (1989) and most recently Roberts (1995)) that assertions, like questions, are also associated with sets of alternatives, and that a relationship (congruence) is **presupposed** to hold between the alternative sets of felicitous question/answer pairs. The missing link, of course, will be that the prosodic focus of a given assertion serves to (partially) determine the set of alternatives associated with that assertion, and in this way to indirectly constrain the question which it can answer, as Jackendoff (1972) first suggested. We'll develop this proposal here along lines suggested by von Stechow (1989) and Roberts (1995).[3]

We begin by making explicit the process by which alternative sets are determined for assertions and questions. The case of assertions is quite simple if we assume (correctly, I think) that each assertion has at least one focused constituent.[4] That is, something like (7) will suffice.

(7) The **focus alternative set** corresponding to a constituent δ, $\|\delta\|$, is the set of all interpretations obtained by replacing all (functionally — m.c.) focused constituents in δ with variables, and then interpreting the result relative to each member of the set of all assignment functions which vary at most in the values they assign to those variables. (Roberts 1995:11)

So, for example, the set of alternatives associated with (6a) would be the result of replacing the constituent *Greece* with a variable of the appropriate sort (say, a variable over places) and ranging over all other variables in the domain of that sort. What we get is a set of propositions P such that:

[3] We'll assume, along with Roberts, that the alternatives associated with an assertion can be thought of as part of its presupposed content — as opposed the preferred alternatives posited in the previous section for questions. This allows us to maintain the position of the previous section that assertions simply prefer propositions.

[4] Importantly, we'll say that this constituent must **contain** a prosodically focused element, but need not be equal to a prosodically focused element. So, in the sentence *Greg always butters his BREAD*, for example, possible focused constituents would be *his bread*, *butters his bread*, *always butters his bread* or *Greg always butters his bread*. In order to distinguish prosodic focus from "functional" focus, we will mark the latter with brackets and a subscript F.

(8) $P = \{ p \mid (\exists u \in D)[p = \textbf{Marcia went to } u \textbf{ last year}] \}$

Computing the alternatives associated with questions is a bit more tricky. In the previous section, it was suggested that questions prefer alternatives. This cannot be totally correct, if we are to maintain a coherent view of the nature of common ground. That is, the common ground is taken to be a set of propositions, and the alternative sets we've been entertaining thus far are also sets of propositions. This would suggest that questions are somehow incompatible with being added to the common ground, in that they are added to the common ground in a different way. This is undesirable for a number of reasons, one of which being that we would like to check the felicity of questions with respect to presupposition just as we check the felicity of assertions, and we cannot do this without the content of the question being added to the common ground. Fortunately, von Stechow (1989) provides a solution to this little puzzle by providing a semantics for questions in which they do, in fact, denote a particular type of proposition, which is related to the set of alternatives that we need for our definition of congruence. This set of alternatives can be computed separately, in accordance with (9), where $|\cdot|_f$ stands for the "regular" denotation of $\cdot$.

(9) The **Q-alternatives** corresponding to an utterance α, $Q\text{-Alt}(\alpha)$, are

$\{ p \mid (\exists u^{-1}, \ldots, u^{-n} \in D)[p = |\delta[u^{-1}/\ldots/u^{-n}]|_f] \}$, where

a. α has the logical form $\text{wh}_{-1}, \ldots, \text{wh}_{-n}(\delta)$, with $\{ \text{wh}_{-1}, \ldots, \text{wh}_{-n} \}$ being the possibly empty set of wh elements in α, and

b. D is the domain of the model for the language, suitably restricted by sort. (Roberts 1995:14)

The "regular" denotation of a question will be the proposition expressed in (10). Note that this proposition is closely related to the Q alternatives above in that it just picks out those situations in which all the Q alternatives are "asked." By this, we mean something like (as Roberts (p.c.) suggests) the truth of all the Q alternatives is under consideration by the interlocutors, or is being evaluated by the interlocutors. In this way, questions do, in fact, prefer alternatives, albeit in an indirect way. We will return to this discussion in §3.

(10) **Interpretation of ?(α):**
$|?\alpha| = \{ s \mid \forall p \in Q\text{-Alt}(\alpha),\ p$ **is asked in** $s \}$.

Now, returning to our example, the set of Q alternatives associated with (5), which we assume to have the logical form in (11) will be the set of propositions Q expressed in (12).

(11) $?[\textbf{where}(\lambda x.\textbf{Marcia went to x last year})]$

(12) $Q = \{ p \mid (\exists u \in D)[p = |\lambda x.\textbf{Marcia went to x last year}(u)|] \}$
$= \{ p \mid (\exists u \in D)[p = \textbf{Marcia went to } u \textbf{ last year}] \}$

Congruence, then, expressed formally in (13), is a relation between some utterance and a question that requires that the focal alternatives of the utterance be the same set as the Q alternatives of the question.

(13) Move β is **congruent** to a question $?\alpha$ iff $\|\beta\| = Q\text{-}\mathbb{A}(\alpha)$.

It is easy to see that the Q-alternatives of (5), expressed in (12), are the same as those of (6a), which are expressed in (8). It should also be clear that the focal alternatives of (6b)-(6d) will be different than (12). These examples are thus ruled out as congruent to (5), and thus violate the presupposition that they be congruent to the question under discussion. That is, the infelicity of these utterances is predicted as a case of presupposition failure.

And, as in any case of presupposition failure, we would expect accommodation to play a role. That is, consider the case where a sentence like (6b) is uttered out of blue (i.e., with no explicit question under discussion). We can say that it is still the case that this utterance is presupposed to be congruent with a question under discussion, although we may not know what that question is, or we may not have been explicit about what that question is. We do know, however, that if the congruence presupposition is to be satisfied, the Q-alternatives associated with the question under discussion must be the same as the focal alternatives of (6b) (given in (11)).

(14) $\{p \mid (\exists x \in D)[p = x$ **went to Greece last year**$]\}$

That is, we know that the utterer of (6b) wishes to entertain a set of Q-alternatives that are the same as those in (11). If this is not objectionable to the other interlocutors in the discourse, they will be accommodated, which in the end has the effect of introducing into the common ground, some question whose denotation is given in (15). One such question would be *Who went to Greece last year?*.

(15) $\{s \mid \forall p \in \{p \mid (\exists x \in D)[p = x$ **went to Greece last year**$]\}$. p **is asked in** $s\}$

3 The Domain of Q-Adverbs

With these technical details out of the way, I would like to turn now to the central issue of the paper: namely, the question of how the domain of adverbs of quantification is determined. As alluded to in the introduction, a number of proposals have surfaced in recent years, and most of these assume the existence of a tripartite structure one of whose elements is a restrictive clause. The material that gets mapped into this restrictive clause has been a topic of great debate. In this section, I will discuss what I take to be three major types of these proposals, and will argue both that they all have an element of truth to them, and that in the end they are all incomplete or inadequate in some way.

The view that should emerge, I will argue, is that it is impossible to correctly determine the domain of a Q-adverb without considering the question under discussion when the utterance containing the Q-adverb is introduced. In §4, I will argue that the observations in this section are compatible with a purely pragmatic theory of domain restriction, and that such a theory accounts for a wider range of facts in a more adequate and more elegant manner.

3.1 Restrictive Clauses

In the classic GQ analysis of determiners, the restriction and nuclear scope of a given quantifier is given by an obligatory syntactic clause. That is, in (16), the clause

woman in the room denotes the set of entities in *every*'s restriction, while *has won a Nobel Prize* denotes the set corresponding to the nuclear scope. The quantifier simply expresses a relation between these two sets.

(16) Every woman in the room has won a Nobel Prize.

Unlike determiners, however, an adverb of quantification does not require an explicit restrictive clause, although it has been argued that such clauses are available on an optional basis. Temporal adverbial clauses headed by adverbs like *when*, *after* and *before*, as well as *if-clauses* and temporal PP-adjuncts, seem like good candidates for this role, as the examples in (17) illustrate.

(17) a. The heater is always on when people are in the house.

b. The river is always at flood stage after it rains.

c. The heater is always on if it is cold outside.

d. The river is always at flood stage on Sundays.

Certainly, an example like (17a) can mean that the set of cases in which people are present in the house is a subset of cases in which the heater is on.

The facts, however, are considerably more complex than these simple examples suggest. Consider, for example, the utterances in (18).

(18) a. Marcia always takes the bus home when it rains.

b. Marcia always takes the bus home after it rains.

c. Marcia always takes the bus home if it rains.

d. Marcia always takes the bus home on Sundays.

It is clear that the quantifier in, for example, (18a) does not range over cases in which it is raining, but rather cases in which it is raining AND Marcia is going home. That is, the when clause in this example determines an aspect of the domain of quantification, but is not by itself strong enough to provide a completely restricted domain. Any analysis of this phenomena, then, which naively mapped the information in temporal adverbials into a Q-adverb's restriction and stopped at that would make the wrong predictions in the cases above. Few, however, would be so naive, since it has been widely observed that the domain of quantificational determiners can be restricted by contextual factors, and we would not expect quantificational adverbs to behave any differently, especially given the fact that they may appear without overt syntactic restriction in a variety of cases. One possible generalization, then, would be that the modifiers in (18) always **constrain** the restriction of the Q-adverb, thus allowing for the possibility of additional restriction by contextual information. A proposal more or less along these lines was made by Lewis (1975), Stump (1981, 1985), Farkas and Sugioka (1983), Partee (1984), Farkas (1985), and Berman (1991).

However, these proposals cannot be correct, either. Johnston (1994), for example, notes that the utterances in (18) have more than one reading. In one possible reading, predicted to exist by the accounts above, the adjunct (partially) provides the restriction for the Q-adverb. This reading naturally arises when the examples in (18) are used to answer questions like those in (19).

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(19) a. How does Marcia get home when it rains?

b. How does Marcia get home after it rains?

c. How does Marcia get home if it rains?

d. How does Marcia get home on Sundays?

The second reading, which is not accounted for by the proposals above, is one in which the head clause (again, partially) provides the restriction. This reading arises naturally when the utterances in (18) are used to answer the question in (20).[7]

(20) When does Marcia take the bus home?

On the basis of these examples, Johnston proposes that the utterances in (18) are actually structurally ambiguous, and that the readings above arise as a result of this ambiguity. That is, for Johnston, an example like (18a) can be associated with either structure in (21). In (21a), the when-clause is adjoined to IP while in (21b) the same clause is adjoined to VP.[8]

(21) a. $[_{IP}\ [_{IP}$ Marcia always $[_{VP}$ takes the bus home$]]\ [_{PP}$ when it is raining$]]$

b. $[_{IP}$ Marcia always $[_{VP}[_{VP}$ takes the bus home$]\ [_{PP}$ when it is raining$]]]$

The existence of the two readings are then explained by assuming the existence of a tripartite structure at LF, and adopting a form of Diesing's (1992) mapping hypothesis, given below in (22).

(22) **Determining the Restriction and Nuclear Scope of an Adverb of Quantification**:

(i) Make the adverb of quantification the first element in the tripartite structure.

(ii) Factor material from the VP in the scope of the adverb of quantification into the nuclear scope.

(iii) Factor material adjoined to IP or in the Spec of IP into the restriction. (Johnston 1994:35)

Returning to our example, we can see that in (21a) the when-clause will be mapped (in accordance with the principle in (22)) into the restriction, giving us the reading where this clause restricts the domain of the Q adverb. The structure in (21b), however, does not immediately give us the other reading, as Johnston would like. That is, in this structure **nothing** (except the moved subject *Marcia*) is either adjoined to or in the Spec of IP, and thus nothing is mapped into the restriction. But, as Johnston

[7] Johnston actually claims that adjunct clauses headed by the elements *if* and *whenever* have only the reading in which the adjunct provides the restriction. To my ear, however, both (18c) and *Marcia takes the bus home whenever it rains* seem like felicitous answers to (20) and thus have their restrictions constrained by the head clause.

[8] I am simplifying his structures somewhat, in that he adopts the VP-internal subject hypothesis, and thus posits movement of the subject into some VP-external position at surface structure. Nothing hinges on this, as far as I can tell.

notes, the Q-adverb in this utterance is not left unrestricted, so we must instead posit some mechanism by which the information in the head clause is copied into the restriction at LF. Johnston proposes that a process of variable binding, coupled with a general constraint against vacuous quantification can provide this mechanism, but the account seems otherwise unmotivated. In addition, is not clear why it must be the **head** clause that is copied into the nuclear scope, and this predicts that the reading in which the adjunct restricts the quantifier domain should also be available for the structure in (21b). I would maintain that this spurious ambiguity is something to avoid. In any case, the tattered mapping hypothesis ends up looking like (23), and on this view the syntactic structure underspecifies the semantic structure.

(23) **Determining the Restriction and Nuclear Scope of an Adverb of Quantification:**

(i) Make the adverb of quantification the first element in the tripartite structure.

(ii) Factor material from the VP in the scope of the adverb of quantification into **either the restrictive clause** or the nuclear scope.

(iii) Factor material adjoined to IP or in the Spec of IP into the restriction. (Johnston 1994:41)

So where does this discussion leave us? We have shown to be inadequate analyses which attempt to directly correlate the denotation of a particular adverbial adjunct with the restriction of Q-adverbs. On the one hand, we have seen cases where the restriction suggested by these clauses is incomplete, and, on the other hand, we have introduced cases where the relevant clause doesn't seem to correspond to the restriction at all. In addition, we have shown that a proposal by Johnston (1994), based on the work of Diesing, which provides a syntactic explanation for the facts above, leads to inelegant and otherwise unmotivated complications in the syntax-semantics interface. Even if Johnston's proposal were correct, it should be pointed out, his theory of domain restriction would still be incomplete in that he provides no explicit mechanism by which Q-adverbs that do not co-occur with explicit adverbial modifiers get their domain restriction, nor any mechanism by which contextual restrictions could arise. I would argue instead that the key to these examples lies with the question under discussion at the time at which the utterance is introduced. For those cases in which, for example, *a when*-clause appears to restrict the Q-adverb, it must be the case that it is being used in response to a question like (19). In cases where it does not, then the question under discussion must be like (20). In either case, it is **the question** that is proferring the relevant alternatives, not any explicit clause in the answer. So what I am claiming here is that temporal adverbial clauses are not restricitive clauses at all, but merely are used to indicate that a relevant set of situations has been proferred by an explicit or implicit question. This explains, in some sense, their optionality in that if the situations under discussion are sufficiently clear, then the use of such a clause would be unnecessary. We will return to this discussion in §4.

3.2 Association with Focus

Since Rooth (1985), and in later work by (among others) de Swart (1991) and Krifka (1992), the interaction between focus and adverbs of quantification has not gone

unrecognized. Consider the classic examples in (24) (originally from Rooth (1985), I believe) and the not-so-classic example in (25).

(24) a. In Saint Petersburg, officers always escorted [BALLERINAS]$_F$.

b. In Saint Petersburg, [OFFICERS]$_F$ always escorted ballerinas.

(25) Marcia sometimes buys [Turkish COFFEE]$_F$.

It is not hard to see that the utterances in (24a) and (24b) have different truth conditions. That is, the former is true if whenever officers escorted someone in Saint Petersburg, it was ballerinas they escorted. The latter, on the other hand, is true if whenever ballerinas were escorted by someone in Saint Petersburg, it was an officer who escorted them. The difference between the two cases, of course, is in the domain of situations which *always* ranges over.

Rooth (1985) deals with these examples in terms of a general theory of association with focus, a sketch of which might go something like this:[7] (i) take the sentence without the adverb, (ii) replace the focused constituent with an existentially quantified variable, (iii) map the result into the restrictive clause, (iv) map the original sentence into the nuclear scope (von Fintel 1995:16). As an example, consider the utterance in (25). In this case, the focused constituent is *Turkish coffee* so we replace that with an existentially quantified variable of the appropriate type. This will give us a set of situations in which Marcia buys something, and we take that to be the restriction of *sometimes*. If we put the focused constituent back and take the resulting proposition as the nuclear scope, we get close to the correct truth conditions. Namely, that some of the situations in which Marcia buys something are also situations in which she buys Turkish coffee.

As elegant and correct as this seems for the simple examples above, various counterexamples to this proposal have surfaced in the literature in recent years. Most of them are of the type in (26) (this one is like one from Partee (1991), and others have been independently proposed by Vallduví (1992) and Roberts (1991)).

(26) a. Jan always gives the award to the [GRADUATE STUDENTS]$_F$.

b. No, PETER always gives the award to the graduate students, and MARCIA does too.

Now, Rooth (1985) predicts that (26a) should mean something like the following: in all those cases in which Jan gives the award to someone, it is the graduate students that she gives the award to. (26b) is predicted to mean that whenever someone gives the award to the graduate students, it is Peter, and this contradicted by the continuation. But (26b) is not internally contradictory, and should mean something like in all those cases in which Peter gives handouts to someone, it is the graduate students that he gives handouts to. This is a problem for Rooth (1985). That is, if prosodic prominence determines focus and focus determines the domain of *always*, we are left without an explanation for how the quantifier in (26b) can have the same domain as the one in (26a). On the other hand, note that this problem does not

[7] Kudos to von Fintel (1995) for boiling it down to these essentials. The interested reader will, of course, consult Rooth (1985) for the technical details, or Krifka (1992) for a more refined version.

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arise if we assume that it is not the prosodic focus, *per se*, that gives rise to the domain of *always*, but rather that it is the question under discussion that prefers the relevant set of alternatives in this case. The utterance in (26a), by virtue of its prosody, is presupposed to be congruent with a question whose Q-alternatives is a set of propositions where Jan always gives an award to someone. Then, as Roberts (1995) suggests in a parallel example involving *only*, in order to explain the relevance of the utterance of (26b) to the immediately preceding utterance, given its parallel form and contrasting prosodic focus, we can assume that the second speaker is offering a correction to the first. The alternatives under consideration, it seems, are not just cases in which Jan gives an award to someone, but rather cases in which someone gives an award to someone (otherwise, the interlocutors would not care about Peter). In his utterance, then, the second speaker attributes to Peter a property which the first speaker attributed to Jan. That property is that when he or she gives an award to someone, it is the graduate students that he/she gives it to.

It should be noted, however, that the problem with Rooth's theory is not limited to cases involving "corrective" focus. Any case in which a number of questions under discussion could in principle be being addressed will be problematic. For example, consider the exchange in (27).

(27) a. Who does Jan give her handouts to?

b. Jan always gives all of her handouts to the [GRADUATE STUDENTS]$_F$.

An association with focus theory like that of Rooth, Krifka or de Swart will predict that the utterance in (27b) should mean something like the following: the situations in which Jan gives all of her handouts to someone are a subset of the situations where she gives all of her handouts to the graduate students. Now, imagine a situation where Jan has some handouts and decides to keep some for herself before distributing the rest to both the graduate students and the faculty. Such a situation, it seems, would be inconsistent with the utterance in (27b), yet the theory would predict the opposite. That is, this wouldn't be a situation where Jan distributes all of her handouts to someone (she has decided to keep some for herself), so it shouldn't have to also be a situation where she gives all of her handouts to the graduate students (leaving Jan free to distribute them to anyone in the department). Indeed, in this case, the association with focus theory seems to predict the wrong domain entirely. The correct truth conditions should be more like the following: in cases where Jan has handouts and gives them to someone, she gives all of them to the graduate students. Again, the key is the question under discussion. That is, if the question under discussion is the locus for the relevant alternatives, the intuitive domain of the Q-adverb in (27b) corresponds exactly to the alternatives proferred by the explicit question in (27a). Rooth's truth conditions, on the other hand, would be more appropriate as an answer to the question in (28).

(28) Who does Jan give all of her handouts to?

In this case, both the question and answer can refer to a situation in which Jan has, for example, three separate handouts and only gives the full of set of three to the graduate students. Note that Rooth's truth conditions do not rule out Jan giving the just two of the handouts to the faculty, and this seems correct given the situation

sketched above. The point to take from all this, of course, is that it is not the utterance itself (or the prosodic focus of the utterance itself) that determines the domain of the adverbs in these cases. Rather, it is the question to which the utterance is a response that is important, as I have been claiming all along.

3.3 Presuppositional Restriction

The effect of presupposition on quantificational structure has been noted several times, most prominently by Berman (1991), but also by Schubert & Pelletier (1989) and others. That is, in examples like (29), the presuppositions of the nuclear scope appear to partially define the cases being quantified over.

(29) a. A cat always lands on its feet.

b. Marcia usually takes the bus home when it rains.

In (29a), which appeared originally in Schubert & Pelletier, the proposition expressed is not that it is true in all cases that a cat lands on its feet (most of us take this utterance to be true, while we do not expect to be pelted by falling cats on the way to the office). Rather, the sentence means something like the following: in all cases where a cat is falling towards the ground, it lands on its feet. Similarly, in (29b), we have previously observed that the domain of *usually* is not the set of situations where it rains, the set of situations where it rains and where Marcia goes home. This "additional" domain restriction is readily explained by a principle such as Berman's (1991), which is given in (30).

(30) **Berman's Presupposition Hypothesis:**

> The hypothesis is the following: in the logical representation of a quantified sentence (as analyzed in terms of restricted quantification), the presuppositions of the nuclear scope become part of the restrictive term. (Berman 1991:88–89)

That is, in the case of (29a), *land* lexically presupposes that its subject starts out falling through the air. This gives us something close to the restriction we want. In (29b), we can assume that taking the bus home entails an intent to go home, and this too gives us something like the correct domain in this case.

As Johnston (1994) notes, that such a principle would hold should not be surprising given the general nature of quantification. That is, he points out, a quantificational statment can be thought of as being about how many of those cases which meet the description in the restriction satisfy the test in the nuclear scope. The fact that the nuclear scope's presuppositions appear to constrain those cases in the restriction can be thought of as a means to ensure that no quantificational case fails to satisfy the test in the nuclear scope because of presupposition failure. If that was the case, it would not be "fair" to ask whether or not that case satisfied the nuclear scope.[10] This makes sense, but it suggests a more general requirement that the cases in the domain be "relevant to the discussion at hand" in order for the quantification to be considered fair. That is, when checking a certain case in the domain against the test

[10] The term "fair" presented in Johnston, is credited to Ladusaw (p.c.).

in the nuclear scope, we would not want to check cases that, for the purposes of the discussion at hand, were irrelevant. These will include cases that violate the presuppositions of the nuclear scope, but will also include situations that do not support any of the alternatives proferred by the question under discussion. For example, consider the utterance in (41).

(41) Jan usually butters her bread.

The truth conditions for this sentence are something like the following: in typical cases where Jan has bread and is going to eat it, she butters it. That is, we wouldn't count this sentence to be false if Jan didn't butter her bread before placing it in the refrigerator. And, while the first part of the above domain restriction can be attributed to a lexical presupposition associated with the possessive pronoun *her*, there is nothing about the nuclear scope that presupposes that Jan is about to eat her bread.[5] Jan could, in principle, be buttering bread as part of a bake-off, or buttering bread to give to someone else to eat. That Jan is about to eat her bread is an **implicature**, but it still finds its way into the nuclear scope. Why? Because, out of the blue, the most easily imagined situation under discussion which is compatible with Jan buttering her bread is one in which she is about to eat it herself. It is quite easy to defeat this implicature, and in this case the component of the restriction that requires that Jan be about to eat her bread is also defeated. The example in (42) illustrates.

(42) Jan usually butters her bread before feeding it to the pigeons in Golden Gate Park.

It is these sorts of Heimian arguments in favor of the presuppositions of the nuclear scope constituting the set of situations in the restrictive clause to be useful and usually correct. We note, however, that this hypothesis is incomplete and would in addition need that an explicit copying of this information be done at the level of logical form. It will be argued that the effect described by Berman follows naturally from the pragmatic view of domain restriction sketched in §4, and that such an account is ultimately more complete. That is, the effects described in this section will follow naturally from our theory of presupposition in general, and the theory will not need to be supplemented in the ways reviewed above.

4 A Pragmatic Account

In this section, I introduce a theory of adverbs of quantification that treats these elements as generalized quantifiers, but rejects the notion that their restrictor is made explicit in logical form and computed by grammatical processes. Instead, I will claim that Q-adverbs range freely over a set of relevant situations, and that a component of pragmatic processes determines what this set of situations will be.

4.1 A Situation Semantics for Adverbial Quantification

We begin by adopting Kratzer's (1989) version of situation semantics, which can be taken to involve (at least) the following ingredients:

[5] I am grateful to Christian Ebert (p.c.) for making this clear to me.

S	the *set of possible situations*
A	the *set of possible individuals*
$\leq \subseteq S \times S$	the 'part-of' relation
$\wp(S)$	the power set of S, the *set of propositions*
$W \subseteq S$	the *set of possible worlds*

As may or may not be evident from the above, possible situations and possible individuals are the primitives, and situations themselves stand in a 'part-of' relation. That is, it is possible for one situation to contain another. The set of worlds are taken to be the maximal elements in S with respect to the 'part-of' relation, and propositions are taken to be persistent sets of situations. That is, if a proposition contains some situation s which supports it, it must contain all the supersituations of that situation, up to and including the world w, that s is a part of.

The idea, then, that we've been assuming throughout the paper but now want to make explicit is that adverbs of quantification relate sets of situations, just as determiners relate sets of individuals. So, for example, the meaning of a sentence like *The heat is always on when it is cold* can be intuitively stated as the following: the situations which support the proposition *is cold (at some time t)* also support the proposition *the heat is on (at some time t)*.[12] Ranging over situations in this way, however, presents a problem in light of the fact that any situation may contain or be contained by another. We risk counting things more than once, as the following example involving a frequency adverb illustrates.[13]

(33) John climbed Mt. Holyoke twice.

Now, suppose we want to count the situations in which John climbed Mt. Holyoke. As von Fintel points out, even if John climbed Mt. Holyoke once, it will be the case that many situations will exist in which John climbed Mt. Holyoke. For example, there is a situation that includes John climbing Mt. Holyoke and nothing else, and a situation that includes John climbing Mt. Holyoke and his celebratory dinner afterwards, and so on. The catch is that the first situation is really part of the second, so both shouldn't be counted separately. What others have proposed to do in this case is to count the **minimal** situations that support the fact that John climbed Mt. Holyoke, i.e., situations that have no proper parts that also support this fact. Given a set S of situations, we can define the minimal situations in S as in (34).

(34) **Minimality (Berman 1987, Heim 1991):**

$$min(S) = \{ s \in S \mid \forall s' \in S,\ s' \leq s \Rightarrow s' = s \}$$

The function $min(S)$ gives us the set of situations in S that do not have proper parts that are also in the set. In the case of a proposition, the set of minimal situations that support it are those situations which contain just enough parts to support the proposition, but no "extra" parts.[14]

[12] We'll be playing fast and loose with the notion of time throughout.

[13] This example is due to von Fintel (1995).

[14] von Fintel (1995) provides an interesting discussion of the problems that this view of minimality presents with respect to propositions involving stative or atelic predicates. Like von Fintel, I will leave the problem of individuating situations correctly in these cases to further research.

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So, with this technical problem out of the way, we are now in a position to provide a semantics for Q-adverbs. To facilitate the discussion, we introduce the example in (35a), which we take to have the logical form in (35b). As before, the capital letters in this example indicate intonational focus, while the functionally focused constituent is marked with subscript *f*.

(35) a. Jan always buys [Turkish COFFEE]$_f$

b. **always(Jan buys Turkish coffee)**

Now, I would like to claim that this sentence is interpreted in accordance with the rule in (36), a rule which at first may seem surprising in that no reference to an explicit restriction is made.

(36) **Interpretation of 'always'** (α):

Let $R \subseteq S \times S$ such that
$\forall s, s' \in S$, $\langle s, s' \rangle \in R \Leftrightarrow s' \in proto(f(s))$, then

$s \in$ **always** α iff $\forall s'$ such that $\langle s, s' \rangle \in R$, $\exists s''$ such that $s' \sqsubseteq s''$ and $s'' \in [\![\alpha]\!]$.

A few observations, it seems, are in order at this time. First, observe that the rule above is reminiscent of many rules that have been proposed for modals. That is, I claim here that the interpretation of a Q-adverb is dependent on a function *f*, which looks a bit like a function that Kratzer (1981) called the **modal base**. The intuitive idea is the same: we want *f* to return contextual information that is somehow relevant to the interlocutors in a discourse. It differs from Kratzer's, however, in that here it is a function from situations to sets of propositions, i.e., to something like a **local common ground**, whereas I take it to be a function from situations to a set of situations, more akin to a **context set**. Of course, one could recover the local context set from the Kratzerian modal base simply by taking its intersection. My choice is motivated purely by technical presentational reasons, as should become evident shortly.

Q-adverbs, it is claimed, range over the minimal situations in the local context set. Returning to our example, suppose our local context set consisted just of those minimal situations in which Jan was buying something.[17] Intuitively, what *always* seems to require is that all these situations are also situations in which Jan bought Turkish coffee. This, however, cannot be totally correct. That is, recall that the situations we are ranging over are minimal situations, the smallest situations that satisfy the conjunction of propositions in the contextually-given restriction. These situations, however, since they are minimal, may not be large enough to satisfy the proposition expressed by the nuclear scope. What the rule in (36) requires, then, is that each minimal situation in the restriction be part of (i.e., be extendable to) a situation that satisfies the nuclear scope. In our example, then, we are requiring that each of the minimal situations in which Jan is buying something can be extended to a situation in which she is buying Turkish coffee. This seems correct.

[17] The process by which this can be determined will fit the focus of the remainder of this paper.

A huge question, however, remains. How was it that $f(s)$ picked out just those situations in which Jan was buying something? It is one thing to say that the denotation of f is contextually determined. It is the burden, however, of a purely pragmatic account to be explicit about how this contextual determination works, and that is the subject of the remaining sections of the paper.

4.2 Contextual Domain Restriction

Throughout the paper, we have argued that a wide variety of contextual information is employed to restrict the domain of Q-adverbs, including most notably presuppositional information and alternatives preferred by the question under discussion. And, in the formal account of the previous subsection, we have a posited a function f not unlike Kratzer's modal base which provides a formal "hook" to this contextual information by making available a local context set, which we have suggested is the set of situations over which Q-adverbs range. The time has come now to link these two ideas together by providing an account of how the local context set is determined in terms of our previous observations about presupposition and congruence.

So consider again the example from the previous subsection, repeated here in (37), and recall that we decided that its domain should be something like the set of all minimal situations in which Jan buys something. This, of course, is the domain predicted by an attraction with focus theory, and we would want our results to be consistent with that body of work.

(37) Jan always buys [Turkish COFFEE]$_F$

In considering this example, we observe first that this utterance is a felicitous response to the question in (38). That is, one possible context in which this (37) could be uttered is in a context where the question under discussion is (38).[16]

(38) What does Jan buy?

Now, recalling our discussion from §2, the Q-alternatives associated with this question is the set of all propositions where it is true that Jan buys something. The union of this set of propositions, in turn, will return a single proposition which supports situations like one in which Jan buys Indian coffee, one in which she buys Turkish coffee and so forth. It will not, however, include situations in which Jan doesn't buy anything. The minimal situations in this resulting set are those situations just large enough to support that Jan buys these various types of coffee while supporting nothing else. It is these situations that we want to quantify over. As a first stab, then, at what f should look like, it seems that at very least we would like it to pick out the union of the Q-alternatives of the question under discussion. A constraint like the one in (39) does the trick.

[16] It could also answer the question *What does Jan always buy?*, which for the purposes of this discussion, we will take to be more or less equivalent to (38). It may be the case that in a question like (38), an implicit Q-adverb (something like *typically*) is present. In any case, I would like to suggest that in computing the focal alternatives for utterances like (37) and the Q-alternatives for questions, it is possible to "raise" the Q-adverb out of its surface position and thus remove it from consideration when the alternatives are computed. There is probably a more sophisticated way to look at this.

(39) For any utterance ϕ with question under discussion α:

$$\forall s \in S,\ f(s) = \cup Q(\alpha)$$

But why should this be? Well, recall that the Q alternatives corresponding to a given question can be taken to encode the set of propositions under consideration. Indeed, it is the set of Q alternatives that are being "asked" in any situation that supports the acceptance of the question. And, if by being asked, we mean that their truth is being evaluated, it is not unreasonable to expect that interlocutors would consider the situations which support the answer to the question as part of a hypothetical context set so that they could be evaluated with respect to other information that they believe to be true. Since f gives us this sort of hypothetical context set, it is not unreasonable to expect that the situations preferred by the Q alternatives would be made available by it. Looking at it another way, taking the union of the Q alternatives to be a part of a local context set can be thought of as a consequence of accepting the **presuppositional content** of a question into the common ground. Carlson (1983), in fact, claimed that the presuppositional content of a question was in fact the **disjunction** of its possible answers (plus the admissibility of its parts). Intuitively, I think, this is intended to capture the idea that the possible answers to a question must be felicitous with respect to the current context. That is, it should not be possible to ask felicitously ask a question whose only possible answers conflict with information already presupposed.

Indeed, as much compatible information as possible from the **global** common ground should be present in the hypothetical context set up by f, since the interlocutors would not want to evaluate these alternatives in a vacuum, but rather against all information that they believe to be true. An argument related to this was made by Roberts (1995a), who argued that all hypothetical contexts are assumed by interlocutors to be optimally realistic for reasons similar to those suggested above. That is, she argued the following:

> "The hypothesis above is motivated by the need to assure that all the interlocutors' assumptions are as similar as possible, whether these are assumptions about the actual world – for which the common ground defines the candidate set – or about hypothetical or counterfactual contexts under discussion. Those aspects of hypothetical or counterfactual contexts which aren't spelled out by the speaker are assumed to be identical with what we know about actuality, as reflected in the common ground, at least insofar as this doesn't lead to contradictions with what's explicitly spelled out. This enables us to avoid misunderstanding, while minimizing the need for detailed (and often redundant) description of hypothetical contexts. (Roberts 1995a:22)"

We can capture this idea formally by altering the constraint in (39) along the lines in (40). Here, we simply require that the situations returned by f also be situations that satisfied all the propositions in the common ground at the time of the utterance.[17]

(40) For any utterance ϕ with question under discussion α:

[17] We follow Roberts (1995) and take CG to be a function from moves (utterances) to the set of propositions in the common ground.

$\forall s \in S.\ f(s) = (\cap \mathcal{C}G(\alpha)) \cap (\cup Q\,A(\alpha))$

Returning to our simple example, then, a derivation of the relevant restriction would proceed as in (41), with $f(s)$ being set to all the situations which support answers to *What did Jan buy?*) for some arbitrary $s \in S$.

(41) $f(s) = \{ s \mid (\exists u \in D)$**Jan buys** u **is true in** $s\} \cap \{s \mid s \in \cap \mathcal{C}G(\alpha)\}$

$min(f(s))$ = the minimal situations in the set above.

And the proposition in (38) will be true if all those situations on the last line can be extended into situations where Jan buys Turkish coffee, which is what we want. Taken another way, we can take the utterance as choosing choosing from the context set only those buying situations which can be extended to situations where Jan buys Turkish coffee.

The account above also gives a satisfactory result for cases involving what has been argued to be explicit restrictive clauses. Recall, for example, the sentences in (18), one of which is repeated here in (42).

(42) Marcia always takes the bus home when it rains.

Now, depending on the focal structure of the utterance, this utterance can felicitously answer either question in (43), as well as a host of more general questions.

(43) a. How does Marcia get home when it rains?

b. When does Marcia take the bus home?

Each of these questions, of course, is associated with a distinct set of alternatives. In the case of (43a) this will be the set in (44a). In the case of (43b), it will be the set in (44b).

(44) a. $\{ p \mid (\exists R \in D)[p =$ **Marcia** R **home when it rains**$]\}$

b. $\{ p \mid (\exists q \in D)[p =$ **Marcia takes the bus home** $q$$]\}$

Setting the union of each of these equal to $f(s)$ will give us the following results: in the case of (43a), we predict that the utterance is true iff all the minimal situations in which Marcia does something to get home when it rains can be extended into situations where she takes the bus home when it rains; in the case of (43b), we predict that the utterance is true iff all the minimal situations in which Marcia takes the bus home when can be extended to situations where Marcia takes the bus home when it rains. That is, we seem to get the two readings observed by Johnston (1994), one of which corresponds to the case in which the *when*-clause provides the restriction, while the other corresponds to Johnston's head-restriction reading. I think these are both correct results, although it seems a little odd to include something like a *when*-clause in both the restriction and the nuclear scope. Q-adverbs, however, are conservative, so this does not affect the interpretation adversely.

There is, however, some subtlety in the data, that is not immediately predicted by our account. The examples in (45) were presented in Johnston (1994) and indeed were taken to motivate his claims about the Mapping Hypothesis.

(45) a. Marcia always takes the bus home when it rains.

b. When it rains, Marcia always takes the bus home.

Johnston observed, correctly I think, that while the example in (45a) has two readings available for it (the two we have been discussing thus far), the example in (45b) does not. That is, in our terms, (45b) cannot answer the question in (42b). And, since our notion of congruence is essentially semantic, we have no way (on the surface) to explain why this might be the case.

The answer, I suspect, has to do with the nature of topicalization, and more specifically, what role left-dislocated elements play with respect to information structure. Indeed, Vallduví (1992) and others have suggested that left dislocated elements correspond to old information, or are (partially presupposed. As a felicitous response to (42b), however, we would expect that the *when*-clause be in focus, or new. Clearly, a better explanation is needed, but I believe that the observations here suggest a step in the right direction.

As a final illustrative example, recall the example in (31), repeated here in (45) and fixed up with explicit focus marking.

(46) Jan always [butters her BREAD].

This, of course, is congruent with a question whose Q-alternatives correspond to a set of propositions in which Jan does something, but this does not seem to be enough to derive the correct restriction. That is, if we set $f(s)$ to the Q-alternatives and stop there, we predict that this sentence should mean that all minimal situations in which Jan does something should be extendable into situations where Jan butters her bread. This is clearly too strong.

All is not lost, however, if we remember what $f(s)$ returns – namely, a hypothetical context which is as much like the actual context as possible with respect to the information in the common ground. And, if an utterance like (46) is accepted by the interlocutors, the (global) context set will entail all of this utterance's presuppositions, one of which is the presupposition that Jan has bread (associated with the possessive *her*). Now, if the hypothetical context set is as much like the real context set as possible, it too will entail that Jan has bread, i.e., all the situations in the hypothetical context set will be situations in which Jan has bread. Our resulting domain, then, will be the set of minimal situations in which Jan is doing something and in which Jan has bread. We can plausibly argue further that an implicature associated with the word *butter* (i.e. that you are about to eat what you butter) further restricts the domain, giving us more or less the set of situations we want: the minimal situations in which Jan is doing something, has bread, and is about to eat it. These all should be extendable into situations in which Jan butters her bread, for the utterance to be true.

5 Conclusions and Issues for Further Study

I have provided a situation-based theory of Q-adverbs in which their domain is computed pragmatically, without reference to an implicit tripartite representation or any grammatical operation. In addition to being more attractive from a conceptual standpoint, such a theory stands to better account for cases discussed above in which contextual information plays a indispensable role in determining the domain of these

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operators. In future work, I would like to better examine cases in Johnston (1994) and Diesing (1990, 1992) that have been taken to motivate an implicit tripartite structure, and to better compare the theory sketched here to other pragmatic theories of this phenomena, such as that of Schwarzschild (1994), Rooth (1992) and von Fintel (1995).

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A Unified Account of *(Ta)myen*-Conditionals in Korean

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0. Introduction

The purpose of this paper is to explore some syntactic and semantic facts about Korean conditionals. In Korean, conditional sentences are typically associated with the verbal suffixes, *-myen* or *-tamyen* which are attached to the head verb in the antecedent of a conditional[1] (henceforth *myen-* and *tamyen*-conditionals, respectively). The main focus of this study will lie on a truth-conditional semantic account of two facts about *myen-* and *tamyen*-conditionals. First, unlike their English counterparts, *(ta)myen*-conditionals do not give any syntactic clues from which we can tell whether they have indicative or counterfactual interpretations. The two different interpretations solely depend on the utterance contexts. Second, *tamyen*-conditionals differ from *myen*-conditionals in that the former cannot be used when the proposition denoted by the antecedent is a given fact, while the latter do not have such a constraint.

As for the semantic framework, this paper draws to a large extent on the theories that are developed by Kratzer (1980) and Heim (1992). In section 1, a syntactic analysis of conditionals is provided based on the framework of Generalized Phrase Structure Grammar (henceforth GPSG, cf. Gazdar, Klein, Pullum, and Sag (1985), henceforth GKPS). In section 2, the general semantic properties of Korean conditionals are discussed together with some semantic differences and similarities among the varieties of *myen*-conditionals. In section 3, based on Kratzer (1980), Heim (1992) and Roberts (1994), a unified version of the truth

[1]Bak(1987) also regards *-tako hamyen* as an independent conditional form, but this conditional seems to be another instance of the *myen*-conditional. This matter will be discussed in section 2.

conditions for indicative and counterfactual conditionals is proposed, which may be considered as a hybrid of Kratzer (1980) and Heim (1992). On this approach, different usages of conditionals marked by different morphology (e.g., Korean) or syntax (e.g., English) are accounted for by the assumption that they have different presuppositions. Section 4 is the conclusion of this paper, where some remaining problems are discussed.

1. Syntax of *(ta)myen*-conditionals

A *myen*-conditional structure in Korean consists of two clauses like those in English: the antecedent and consequent. Unlike in English, however, the morpheme representing a conditional in Korean is syntactically not an independent word. It is a suffix that is attached to the head verb of the antecedent clause.

(1) Nayil pi-ka o-myen, sophwung-un chwiso-toyl-kesita.
tomorrow rain-NOM come-COND picnic-FOC will-be-canceled
'If it rains tomorrow, the picnic will be canceled.'

Another difference is that the linear order between the antecedent and consequent is fixed in normal speech. The antecedent which carries the conditional morpheme always precedes the consequent.[2]

(2) *Sophwung-un chwiso-toy-lkesita. Nayil pi-ka o-myen
picnic-FOC will-be-canceled tomorrow rain-NOM come-COND

In the GPSG framework, this construction can be generated (or licensed) by using the following ID-rule:

(3) S → S[COND], H

Here, COND is a head feature and so it percolates down to the lexical head of the antecedent clause by the Head Feature Convention. The value of COND can be a form of the conditional morpheme: e.g., COND={*myen*, *tamyen*, }.[3] This COND feature can be considered a semantically potent feature which contributes to the semantic interpretation of the structure in which it occurs (GKPS: 223-225). These semantically potent features make their contribution to the interpretation at the highest point of occurrence.

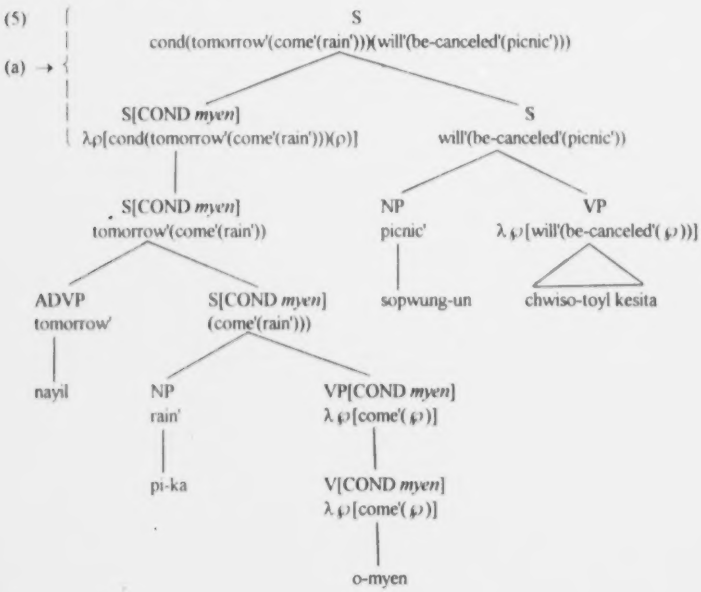
The definition of the features in GKPS is in (4). Here, C and C_0 stand for a daughter node and a mother node respectively, in a local subtree.

[2]In colloquial style, the consequent sometimes precedes the antecedent, giving rise to a so-called afterthought expression.

[3]Precisely speaking, *tamyen* is a complex morpheme consisting of declarative sentence marker *ta* and conditional marker *myen*. This will be discussed in section 2.

(4) Let *f* be a semantical feature. Then a feature specification $\langle f, \alpha \rangle$ is semantically potent on a daughter node labeled *C* in a local subtree *t* iff
(i) $\langle f, \alpha \rangle \in C$, and
(ii) it is not the case that $\langle f, \alpha \rangle \in C_0$ (GKPS 224)

(4) states that a feature specification (the feature name *f* and its value α) is a semantically potent feature only if it is realized on a daughter node but not on its mother node in a local tree. Under this assumption, the analysis of (1) is (5). Here ρ and $\wp$ stand for a sentence variable and an NP variable, respectively. Also note that the antecedent clause is treated as a kind of adjunct, i.e., a functor which takes a sentence-type object as its argument and gives another sentence-type object as its value.



In (5), the node where the semantic contribution of the COND feature is made is in the local tree indicated by (a). Here the syntactic category of the mother node is S, while that of the daughter node is S[COND *myen*], which is the highest S node of the antecedent clause. Hence the sematically potent feature [COND *myen*] satisfies the definition in (4). [COND *myen*] is realized on the daughter node but not on the mother node. In local tree (a), "cond" is a semantic representation of the COND feature. In section 3, it will be proposed how a sentence with the COND feature is interpreted with respect to its utterance contexts, i.e., what the truth conditions of c + cond(ϕ)(ψ) are in terms of Heim (1992).

The linear precedence between the antecedent and consequent is determined by a well-known LP statement in Korean: X < Head (Head follows anything). That is, the syntactic head of a whole conditional is the consequent, and the LP statement requires that it should follow the antecedent.

2. General semantic properties of *(ta)myen*-conditionals

In English, subjunctive conditionals are syntactically distinguished from indicative conditionals in that the head verbs in antecedents of subjunctive conditionals are backshifted, while past forms of auxiliaries like *would*, *might* are used in consequents.

(6) a. If John is in London, he will visit his relatives. (indicative)
b. [To a friend who is sitting on a chair]
If you sit there, you can see a picture on the wall. (indicative)
c. If John were in London, he would visit his relatives. (counterfactual)

In contrast to English, however, *(ta)myen*-conditionals in Korean do not display such a syntactic distinction. They are interpreted as having an indicative or counterfactual reading, depending on their utterance context. For example, *myen*- or *tamyen*-conditionals are used when the proposition p denoted by the antecedent is not a given fact, but compatible with the given context c. (7) can be uttered in a context where the fact that Mary will come is not in the given context, i.e., where the speaker and hearer do not know whether Mary will come or not (hypothetical indicative). Note that in this case, both *myen*- and *tamyen*-conditionals are acceptable.

(7) Mary-ka o { -myen / -ntamyen } ku sosik-ul al swu issta.
Mary-NOM come-COND the news-ACC know-will-be-able-to
'If Mary comes, we will be able to get the news.'

Myen- or *tamyen*-conditionals are also used when the proposition p denoted by the antecedent is not a given fact. The proposition p denoted by the antecedent in (8c) is a given fact in the context c because it is uttered in a context in which the fact that B uses AT&T is already known to be true to A (factual indicative). Note that in this case, *(n)tamyen*-conditional in (8c) is awkward and marked with #.

(8) a. A: Etten hoysa-uy cangkeli-cenhwa-lul iyonghasipni-kka?
which company-GEN long-distance-call-ACC use-INT
'Which company do (you) use for long-distance calls?'

b. B: AT&T-lul iyonghapnita.
AT&T-ACC use
'(I) use AT&T.'

c. A: Kulayyo, AT&T-lul iyonghasi { **-myen** / **#-ntamyen** } manhun
right AT&T-ACC use-COND many
hyeythayk-i issupnita
advantage-NOM exist
'(you make the) right (choice), if (you) use AT&T, (you) have many advantages.'

Myen- or *tamyen*-conditionals can also be used when the proposition denoted by the antecedent is known to be false, i.e., when the proposition p denoted by the antecedent is not compatible with the given context c, as shown in (9).

(9) (in a context where the speaker knows that Mary did not come yesterday)

Mary-ka ecey oass { **-umyen** / **-tamyen** } te caymi-ka issessultheyntey
Mary-NOM yesterday came-COND more fun-NOM exist
'If Mary had come yesterday, (we) would have had more fun.'

(9) is uttered when the fact that Mary came is known to be false (counterfactual subjunctive). In this case, both *myen-* and *tamyen*-conditionals are possible.

From the above observations, we can say that in *myen-* and *tamyen*-conditionals, there is no syntactic or morphological distinction between indicative and counterfactual usages. However, *tamyen*-conditionals differ from *myen*-conditionals in that *tamyen*-conditionals are possible only in hypothetical and counterfactual conditionals. We cannot use *tamyen* in a factual conditional as shown in (8c). Some more examples that show the difference are given in (10)-(12).

(10) (looking at falling rain)

a. # Pi-ka on-**tamyen**, canti-ka salanal-kesita
rain-NOM come-COND lawn-NOM come-to-life-will
'If it rains, the lawn will come to life.'

b. Pi-ka o-**myen**, canti-ka salanal-kesita
rain-NOM come-COND lawn-NOM come-to-life-will
'If it rains, the lawn will come to life.'

(11) (to a woman who is pregnant)

a # Ayki-lul **nahnun-tamyen**, emma-ka kippehasil-kesita
baby-ACC give-birth-to-COND mother-NOM be-pleased-will
'If (you) give birth to a baby, (your) mother will be pleased.'

b Atul-ul **nahnun-tamyen**, emma-ka kippehasil-kesita
son-ACC give-birth-to-COND mother-NOM be-pleased-will
'If (you) give birth to a son, (your) mother will be pleased.'

c Ayki-lul **nahu-myen**, emma-ka kippehasil-kesita
baby-ACC give-birth-to-COND mother-NOM be-pleased-will
'When (you) give birth to a baby, (your) mother will be pleased.'

d Atul-ul **nahu-myen**, emma-ka kippehasil-kesita
son-ACC give-birth-to-COND mother-NOM be-pleased-will
'If (you) give birth to a son, (your) mother will be pleased.'

(12) (to a pregnant woman who already knows that she does not bear twins)

a Ssangtongi-lul **nahnun-tamyen**, emma-ka nollasil-kesita
twins-ACC give-birth-to-COND mother-NOM be-surprised-will
'If (you) gave birth to twins, (your) mother would be surprised.'

b Ssangtongi-lul **nahu-myen**, emma-ka nollasil-kesita
twins-ACC give-birth-to-COND mother-NOM be-surprised-will
'If (you) gave birth to twins, (your) mother would be surprised.'

In (10), the antecedent is true in an actual world (factual). In this case, the *myen*-conditional in (10b) is acceptable, whereas the *tamyen*-conditional in (10a) is awkward. (11a) is also awkward since if a woman is expecting a baby, then it is a normal course of events that she gives birth to a baby, and thus the antecedent cannot be hypothetical or counterfactual. In contrast, (11b) is acceptable since bearing a baby does not necessarily mean giving birth to a son, and thus the antecedent can be hypothetical. (11c,d) are both acceptable since *myen*-conditionals are possible in all kinds of conditionals. On the other hand, (12a,b) are acceptable since the antecedent is counterfactual.

Then, one question that arises is what the property of the morpheme *ta* is that comes before *myen* and triggers the difference between *myen*- and *tamyen*-conditionals. *Ta* in Korean is a morpheme for the declarative sentence marker, which also occurs in embedded sentences.

(13) a Pi-ka o-ass-**ta**
rain-NOM come-PAST-DECL
'It rained.'

b.	Nay-ka	pi-ka	o-ass-**ta**-ko	malhayssta
	I-NOM	rain-NOM	come-PAST-DECL-COMP	said
	'I said it rained.'			

It seems that the appearance of the declarative marker *ta* somehow blocks the speaker's commitment to the truth value of the embedded sentence when it occurs with conditional morpheme *-myen*.[4] And this may be the reason why *-tamyen* is not used in a factual conditional.

The difference can also be seen from telephone conversations. For example, when B hears from A that it is raining now in A's area, B can use a *tamyen*-conditional as well as a *myen*-conditional, even though the fact that it rains in A's area has been mentioned by A just before.

(14) A: Cikum yeki pi-ka o-n-ta.
now here rain-NOM come-PRES-DECL
'It is raining here now.'

B: Kulay! pi-ka on-tamyen canti-ka salanakeyssney
Oh! rain-NOM come-COND lawn-NOM comes-to-life-again-FUT
'Oh! If it is raining (there now), the lawn will come to life again.'

In this case, a *tamyen*-conditional is possible because B does not need to commit himself to the truth value of the antecedent. B just repeats or uses the assertion of A, not his own assertion. And this shows that *tamyen*-conditionals are in some sense similar to *tako hamyen*-conditionals which will be discussed below.

According to Bak (1987), *tako hamyen* is another form that represents hypothetical or counterfactual conditionals. It seems to me, however, that *tako hamyen* conditionals are just another instance of *myen*-conditionals due to the following reasons. First, there is another conditional form *tako hantamyen* which is similar to *tako hamyen*. *Tako hantamyen* contains the conditional morpheme *tamyen* that only occurs in hypothetical and counterfactual conditionals. In contrast, *tako hamyen* contains the conditional morpheme *myen* which occurs in all three kinds of conditionals. Thus, we have a four part analogy in (15). It would be more natural if we can explain the relationships between them, instead of assuming that all four are separate morphemes.

(15) **myen** : tako ha**myen** :: **tamyen** : tako han**tamyen**

In *tako hamyen* and *tako hantamyen*, *tako* is a complex morpheme in which a declarative sentence marker *ta* and a complementizer *ko* are combined. It signals that the preceding element is an embedded clause. The verb *ha* (roughly 'do' in English) in such clause has several different lexical meanings. Among them, the most appropriate meaning in (15) is that of reporting.

[4] At this moment, I do not know the reason why it should be the case.

(16) Kim-i o-keyss-ta-ko **ha**-yessta
Kim-NOM come-will-DECL-COMP say-PAST
'Kim said (he) would come.'

Thus, in the following examples, (ϕ *tako hamyen*, ψ) or (ϕ *tako hantamyen*, ψ) are understood to be roughly equivalent to "if the report (or saying) that ϕ is (were) admitted (granted), then ψ"

(17) Nayil pi-ka on **-ta-ko** { **ha-myen** / **han-tamyen** } sophwung-un
tomorrow rain-NOM come-DECL-COMP said-COND picnic-FOC
chwiso-toyl-kesita
will-be-canceled
'If the report (or saying) that it will rain tomorrow is (were) granted, the picnic will be canceled.'

Tako hamyen- and *tako hantamyen*-conditionals also show the same property as *myen-* and *tamyen*-conditionals, respectively. *Tako hamyen* is allowed in all three kinds of conditionals, but *tako hantamyen* is not allowed in factual conditionals. For example, when the speaker just heard a weather report from someone that says it will rain tomorrow, it is inappropriate to use *tako hantamyen* in (17), but *tako hamyen* can be used without any awkwardness. From this, we can conclude that *tako hamyen* and *tako hantamyen* are just other instances of *myen* and *tamyen*, respectively. In other words, *tako hamyen* is equivalent to *myen* when we include the meaning of *tako ha* into the meaning of the antecedent (*nayil pi-ka on-tako ha* 'it is said that it will rain tomorrow') in that both can be used in factual conditionals. However, *tako hamyen* is also equivalent to *tamyen* when we consider only the embedded proposition without *tako ha* (*nayil pi-ka onta* 'it will rain tomorrow' in (17)) as the antecedent, in that the speaker does not commit himself/herself to the truth value of the embedded proposition. The speaker just uses information that is reported from a third person. In this case, *tako hamyen*-conditionals can be regarded as hypothetical or counterfactual, but not as factual, conditionals.

The summary of this section is as follows. (i) In Korean, the indicative or counterfactual conditionals are not syntactically or morphologically distinguishable, rather the different interpretations come solely from context. (ii) *Tamyen*-conditionals cannot be used when the proposition denoted by the antecedent is known to be true, while in *myen*-conditionals, such a constraint does not exist. (iii) *Tako hamyen*-conditionals differ from *tamyen*-conditionals in that the former only indicates reported information without commenting on its truth or falsity.

3. Truth conditional semantics of *(ta)myen*-conditionals

The purpose of this section is to explore the truth conditions of Korean *myen-* and *tamyen*-conditionals. There have been various analyses of English conditionals within the framework of

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truth conditional semantics, for example, Stalnaker (1968), Lewis (1973), Kratzer (1980, 1989), Heim (1992), and Roberts (1994) among others. What is common among these analyses is the following intuitive idea. In order to determine the truth or falsity of a whole conditional, we need to hypothetically add a set of worlds or situations in which the proposition denoted by the antecedent is true to the set of the worlds or situations that already exist in the context set. If the proposition denoted by the consequent is true in the added set of worlds or situations, then the whole conditional is true. Otherwise it is false. The above authors differ from each other in how to constrain the set of worlds or situations. This paper will review the theories proposed by Kratzer (1980) and Heim (1992), discussing why their theories are not directly applicable in the case of *(ta)myen*-conditionals. Following Roberts (1994), we will propose an explanation for the differences and similarities between the two kinds of conditionals by means of slight modifications of Kratzer (1980) and Heim (1992).

3.1. Presupposition and the difference between *myen-* and *tamyen*-conditionals

According to Stalnaker (1979), participants in a conversation share a set of propositions which are mutually agreed upon among them. This set of propositions is called the *common ground* of the conversation. Based on the notion of common ground, the context set is defined as the set of possible worlds compatible with the common ground. Given that propositions can be thought as denoting sets of possible worlds, we have: context set = ∩(common ground). Based on this notion of context set, Stalnaker characterizes making an assertion as reducing the context set in a particular way. This characterization of assertion is compatible with Heim's (1992) context set and her treatment of a sentence meaning as Context Change Potential (CCP). Heim's definitions of the context set and CCP will be discussed shortly.

As already discussed in section 2, *tamyen*-conditionals cannot be used when the proposition p denoted by the antecedent is already known to be true (when p is a given fact or true in a given context c (i.e. $c \subseteq p$)), while in *myen*-conditionals, such a constraint does not exist. In this subsection, we will address the following questions: (i) what is the difference between *myen-* and *tamyen*-conditionals, and (ii) how can the difference be represented in truth conditional semantics.

To find an answer to the first question, let us consider the example in (8c) again which shows the contrast between the two conditionals.

(8) (in a context where the fact that the hearer uses AT&T is already known to be true to A)

c. A: Kulayyo, AT&T-lul iyonghasi {**-myen** / **#-ntamyen**} manhun hyeythayk-i issupnita.
right AT&T-ACC use-COND many advantage-NOM exist
'(you make the) right (choice), if (you) use AT&T, (you) have many advantages.'

In this example, a *tamyen*-conditional is awkward because the fact that A uses AT&T is already a part of the A's context set. Then what is the grammatical status of this awkwardness? What is involved in the awkwardness seems to have something to do with a presupposition violation. *Tamyen*-conditionals presuppose that the proposition p denoted by the antecedent is not a given fact, i.e., p is not true in all the worlds of the context set of the interlocutors. Then, we can say that *tamyen*-conditional in (8c) is awkward because it violates this presupposition. This assumption seems to be right, because the awkwardness of the sentence in (8c) results from the fact that we cannot tell whether it is true or false. Note that a proposition violating an involved presupposition does not have a truth value (i.e., is not interpretable).

Then how can this presuppositional constraint on *tamyen*-conditionals be introduced into truth conditional semantics? One of the most recent proposals on presupposition and its projection is Heim (1992), and her framework of Context Change Semantics can accommodate this kind of presuppositional constraint. According to her, the meaning of a sentence is its Context Change Potential (CCP). A CCP is a function from contexts to contexts, and contexts are sets of possible worlds. The change effected by the CCP of a sentence consists of updating the information in the context with the semantic content of the sentence. The presuppositions of a sentence are requirements on the context. They determine to which contexts the CCP of a sentence can be applied. CCP definitions of sentences consist of two parts: the first part is for the presuppositional conditions (called *definedness conditions* in Heim (1992)) and the second part is for information updating. Here the first part van be used for the presuppositional constraint on *tamyen*-conditionals.

Heim (1992) uses two different CCP definitions shown in (18) and (19) to represent English indicative and counterfactual conditionals, respectively. (20) and (21) are the definitions of *same* and the Sim_w function, respectively, which are utilized to define (18) and (19). (22) is the definition of rev(ision) function, which is utilized to define (19).

(18) CCP for English indicative conditionals
$c + \text{if } \phi, \psi = \{w \in c: Sim_w(c + \phi) + \psi = \text{same}\}$

(19) CCP for English counterfactual conditionals
$c + \text{if } \phi \text{ would } \psi = \{w \in c: Sim_w(rev_\phi(c) + \phi) + \psi = \text{same}\}$

(20) If c is any context, ϕ any LF, '$c + \phi$ = same' expresses the condition that $c + \phi = c$.

(21) $Sim_w(p) = \{w' \in W: w' \in p \text{ and } w' \text{ resembles } w \text{ no less than any other world in } p\}$

(22) For any context c, LF ϕ
$rev_\phi(c)$, the revision of c for ϕ, is $\cup\{X \subseteq W: c \subseteq X \text{ and } X + \phi \text{ is defined}\}$

(18) states that indicative conditionals are true only in the set of worlds whose element worlds belong to the hypothetical context set $Sim_w(c + \phi)$ which (i) retains all the information in the original context set c along with that contributed by the antecedent ϕ (i.e., $Sim_w(c + \phi)$ is a set of worlds whose elements belong to $(c + \phi)$ and resemble w most closely), and (ii) entails the consequent ψ (i.e. $Sim_w(c + \phi)$ plus the ψ worlds is the same as $Sim_w(c + \phi)$). In counterfactual conditionals, the original context set c is not compatible with ϕ's information,

and thus the whole conditionals are predicted to be vacuously true if we treat counterfactuals the same as indicatives. To avoid this problem, Heim (1992) uses the revision function in (22). $Rev_\phi(c)$ is the union of the sets of worlds X which contain the given context set c and where the presuppositions of ϕ are satisfied. (19) says that counterfactual conditionals are true only in the set of worlds whose elements belong to a hypothetical context set represented by $Sim_w(rev_\phi(c) + \phi)$, which (i) is a set of worlds X whose subset is the original context set c, (ii) is defined when the information contributed by the antecedent ϕ is added to it (i.e., the presuppositions of ϕ are satisfied in the set of the worlds denoted by $rev_\phi(c)$), (iii) entails the consequent ψ, and (iv) whose elements resemble w most closely.

The definitions of CCPs in (18) and (19) may work for *myen-* and *tamyen*-conditionals if we put a definedness condition (presuppositional constraint) on *tamyen*-conditionals to represent the difference between *myen-* and *tamyen* conditionals, and disjoin (18) and (19) to represent that both conditionals can be used for either indicative or counterfactual conditionals depending on the context, as shown in (23).[5]

(23) CCP for *(ta)myen*-conditionals (preliminary version)
[$(c + (\phi\text{-}tamyen, \psi))$ is defined iff $c + \phi \neq c$]
Where defined,
either $(c + (\phi\text{-}(ta)myen, \psi)) = \{w \in c: Sim_w(c + \phi) + \psi = same\}$
or $(c + (\phi\text{-}(ta)myen, \psi)) = \{w \in c: Sim_w(rev_\phi(c) + \phi) + \psi = same\}$

The definedness condition in (23) (the part within square brackets) says that *tamyen*-conditionals are defined only when the modified context set $c + \phi$ (the context set hypothetically modified by addition of the information contributed by the antecedent) is not identical to the original context set c. That is, $c + \phi$ equals c only when ϕ's information is already a part of the given context c. Then, this condition amounts to saying that only *tamyen*-conditionals presuppose that the antecedent cannot be a given fact, and thus can account for the difference between *myen-* and *tamyen* conditionals.

If this approach is pursued, however, a question arises about the rest of the CCP, the disjunct clauses. One of the uncontroversial claims may be that in *(ta)myen*-conditionals, unlike English, the choice between indicative and counterfactual interpretations totally depends on the context. One of the problems for the disjunct clauses is that they provide no way to incorporate this context dependency of the choice of interpretations. (23) simply states that *(ta)myen*-conditionals can have indicative or counterfactual interpretations, but states nothing about how a certain interpretation is determined by which contexts are picked up by the interlocutors. Moreover, according to (23), the same form can have two different truth conditions, and the conditionals seem to be ambiguous. However, it is hard to say that they are really ambiguous since their interpretations differ only depending on the context in which they are uttered. One way to avoid these problems would be to give only one truth condition to *(ta)myen*-conditionals for both interpretations, with a device by which the interpretational differences can

[5] In (23), $(\phi\text{-}tamyen, \psi)$ is an abbreviation of $cond[tamyen](\phi)(\psi)$. (See section 1 for the semantically potent feature COND and its denotation cond.) Likewise, $(\phi\text{-}(ta)myen, \psi)$ abbreviates $cond[tamyen \cup myen](\phi)(\psi)$.

be pragmatically (contextually) explained. This is accomplished in Kratzer (1980) by the notions of modal base and ordering source. In the next section, those notions will be incorporated into the theory of CCPs. Note that Kratzer's theory alone cannot fully account for Korean conditionals, especially the presuppositional facts discussed in this section, because her theory does not have any explicit device which handles presupposition satisfaction.

3.2. Modal base, ordering source, and interpretations of *(ta)myen*-conditionals

In Kratzer (1980), the force of modal expressions like *necessarily, possibly* is not absolute, but is relativized to two contextually determined sets of worlds. One is a set of worlds determined by a function called a ***modal base***. The modal base is a function which takes a world as its argument and gives a set of propositions called conversational backgrounds. The choice of a certain conversational background is determined by the context in which an expression is uttered. Depending on the context, the conversational background can be realistic, epistemic, deontic, empty, and so on. The set of worlds determined by the modal base is the intersection of the set of propositions assigned to any world $w \in W$ by the modal base, which gives the set of worlds $\cap$(modal-base(w)) (or $\cap$f(w)). The other set of worlds is determined by a function called an *ordering source*. The ordering source function takes a world as input and gives as output an ordering among the worlds where a set of propositions g(w) are true. The worlds are ordered by $\leq_{g(w)}$ from the world(s) most like the ideal world to those least like the ideal world. Among the worlds, only the world(s) most like the ideal is (are) considered to be in the domain of the explicit or implicit modal.

As for conditionals, the modal base is f', which is a function from possible worlds to sets of propositions, such that for any worlds w, $f'(w) = f(w) \cup \{p\}$. Here p is the proposition expressed by the antecedent. In this kind of approach, unlike that of Heim (1992), indicative and counterfactual conditionals have the same truth conditions, and different interpretations of the conditionals are obtained by parameterizing the modal base and ordering source. For example, in Kratzer (1980), the material implication interpretation of a human necessity conditional (*if ϕ, then necessarily ψ*) is obtained by a totally realistic modal base and an empty ordering source, while the counterfactual interpretation of the same conditional is obtained by an empty modal base and a totally realistic ordering source.

Following Roberts (1994), I assume modal base (MB) and ordering source (OS) functions to take an ordered triple (i,c,w), where i represents a modal expression, c a context, w a world, instead of just a world argument.[6] Then we may combine the MB and OS functions with Heim's CCPs by revising (23) into (24), with the definitions of Closest Context (CC) in (25) and the ordering $\leq_{OS(i,c,w)}$ in (26).

[6]Robert's (1994) uses a version of Kratzer's (1989) situation semantics, and thus the triple consists of (i,c,s), where s stands for a situation.

(24) CCP for *(ta)myen*-conditionals (final version)
[(c + (ϕ-*kamyen*, ψ)) is defined iff c + ϕ ≠ c]
Where defined,
[c + ϕ-*(ta)myen*, ψ] = {w ∈ c: $CC_{OS(i,c,w)}$[(rev_{ϕ}(c) ∩ ∩MB(i,c,w)) + ϕ] + ψ = same}

(25) Definition for the CC (Closest Context) function
For all sets of worlds X,
$CC_{OS(i,c,w)}(X)$ = {w: w ∈ X and for all w' ∈ X, w $\leq_{OS(i,c,w)}$ w'}

(26) Definition for the ordering $\leq_{OS(i,c,w)}$
For all worlds w and w'∈ W,
w $\leq_{OS(i,c,w)}$ w' iff {p: p ∈ OS(i,c,w) and w'∈ p} ⊆ {p: p ∈ OS(i,c,w) and w ∈ p}

The definedness condition in (24) is the same as that in (23). However, we do not need the disjunct clauses in (23) any longer due to the functions MB and OS. The choice between the indicative and counterfactual interpretations solely depends on what conversational backgrounds are pragmatically picked up. The rev_{ϕ}(c) in (24) is a set of worlds in which all the presuppositions of ϕ are satisfied, as already mentioned in section 3.1. ∩MB(i,c,w) is a set of worlds in which all the propositions in the MB for i,c, and w are true. Thus, the intersection of the two (i.e., (rev_{ϕ}(c) ∩ ∩MB(i,c,w)) is a set of worlds in the MB for i, c, and w in which ϕ's presuppositions are satisfied. If we add ϕ's information to this set of worlds, we get [(rev_{ϕ}(c) ∩ ∩MB(i,c,w)) + ϕ] which is a set of worlds excluding all the non-ϕ worlds from the set of worlds denoted by ((rev_{ϕ}(c) ∩ ∩MB(i,c,w)).

Then we need to pick out a set of the closest world(s) to the ideal world among the set of worlds denoted by [(rev_{ϕ}(c) ∩ ∩MB(i,c,w)) + ϕ]. In order for the whole conditional to be true, ψ must be true in the closest world(s). The closest world(s) is (are) determined by the ordering with respect to the propositions picked up by OS(i,c,w) as shown in (26). (26) states that w is closer to the ideal than any other worlds w' only when the number of the propositions which belong to OS(i,c,w) and are true in w is greater than the number of the propositions which belong to OS(i,c,w) and are true in w'.[7] Then the value of the CC function in (25) is a set of worlds whose elements belong to the set of worlds denoted by [(revϕ(c) ∩ ∩MB(i,c,w)) + ϕ] and are closest to the ideal world. In other words, the value of $CC_{OS(i,c,w)}$[(rev_{ϕ}(c) ∩ ∩MB(i,c,w)) + ϕ] is a set of world(s) closest to the ideal in the MB for i, c, and w in which ϕ's

[7]There is a problem concerning the definition of the ordering in (26). According to this definition, as mentioned above, we determine the closest world(s) to the ideal only by counting the number of the propositions which belong to the set of propositions picked up by the OS(i,c,w) and true in the world(s) in question. If the number of the propositions true in w is greater than that of the propositions true in w', then w is closer to the ideal than w'. A problem for this approach is pointed out in Kratzer (1989). She persuasively argues that it is hard to explain all the relevant phenomena of counterfactual conditionals if we just count the number of the true propositions without considering the contents of the propositions. I.e., not all propositions have equal weight. Some are important, while others are totally irrelevant. To avoid the problem, we may need to incorporate the notion of "lumping" into the definition of the ordering in a fashion shown in Roberts (1994).

presuppositions are satisfied and from which all the non-ϕ worlds are excluded. Then (24) amounts to saying that a whole *(ta)myen*-conditional is true only when the set of world(s) denoted by $CC_{OS(i,c,w)}[(rev_\phi(c) \cap \cap MB(i,c,w)) + \phi]$ entails ψ, which is the correct truth conditions for conditionals.

Definition (24) as it is now allows the intersection between the revision function and the intersection of the MB function to be the empty set. This seems to cause a problem since in this case, the $CC_{OS(i,c,w)}$ function is not defined and thus the whole CCP is not defined either. To solve this problem, I propose a constraint on definedness of $CC_{OS(i,c,w)}$ as follows:

(27) Constraint on definedness of $CC_{OS(i,c,w)}$
For all sets of worlds X, X is in the domain of $CC_{OS(i,c,w)}$ only if $X \neq \emptyset$

(27) simply stipulates that the argument of the function $CC_{OS(i,c,w)}$ must not be the empty set in order for the function to be defined.

Then let us consider some examples discussed in section 1. The hypothetical conditional in (7) has an epistemic modal base and an empty ordering source.

(7)

Mary-ka	o	{**-myen** / **-ntamyen**}	ku sosik-ul	al swu issta	
Mary-NOM	come-COND		the news-ACC	know-will-be-able-to	

'If Mary comes, we will be able to get the news.'

The value of $\cap MB(i,c,w)$ is a set of worlds in which all the known propositions are true. In this case, there is no presupposition involved, the value of $(rev_\phi(c) \cap \cap MB(i,c,w))$ is the same as that of $\cap MB(i,c,w)$. The value of $[(rev_\phi(c) \cap \cap MB(i,c,w)) + \phi]$ is a set of worlds of all known propositions minus the worlds in which Mary does not come. The value of $CC_{OS(i,c,w)}[(rev_\phi(c) \cap \cap MB(i,c,w)) + \phi]$ is the same as that of $[(rev_\phi(c) \cap \cap MB(i,c,w)) + \phi]$ due to the empty ordering source. The empty ordering source assigns an empty set of propositions to all possible worlds, so that we cannot determine an ordering among the worlds with respect to the set of propositions picked up by OS(i,c,w). Hence, the value of $CC_{OS(i,c,w)}[(rev_\phi(c) \cap \cap MB(i,c,w)) + \phi]$ is the same as that of $[(rev_\phi(c) \cap \cap MB(i,c,w)) + \phi]$) in (7). (7) is true only when the consequent ***ku sosik-ul al swu issta*** ('we will get the news') is true in the set of worlds of $CC_{OS(i,c,w)}[(rev_\phi(c) \cap \cap MB(i,c,w)) + \phi]$.

The modal base of the factual *myen*-conditional in (8c) has to be totally realistic to guarantee all the facts in w

(8) (in a context where the fact that the hearer uses AT&T is already known to be true to A)

c A

Kulayyo,	AT&T-lul	iyonghasi	{ -**myen** / #-**ntamyen** }	manhun		
right	AT&T-ACC	use-COND		many		
hyeythayk-i	issupnita					
advantage-NOM	exist					

'(you make the) right (choice), if (you) use AT&T, (you) have many advantages.'

The value of $\cap$MB(i,c,w) is a set of worlds w where some subset of the propositions true in w are all true (i.e., a set of worlds in which some of the facts in w are true). The value of (rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)) is the set of worlds in which the presuppositions of the antecedent *AT&T-lul iyongha* ('B uses AT&T') are satisfied. Since no presuppositions exist in the antecedent, the value of (rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)) is the same as that of $\cap$MB(i,c,w). The value of [(rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)) + ϕ] is also the same as that of (rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)), because the set of worlds in which the antecedent is true is already a part of the set of worlds (rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)). Here the relevant ordering source is empty. Hence $CC_{OS(i,c,w)}$[(rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)) + ϕ] does not narrow down the set of worlds of [(rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)) + ϕ] any further. The whole sentence is true only when the consequent *manhun hyeythayk-i issupnita* ('B has many advantages') is true in the set of worlds of $CC_{OS(i,c,w)}$[(rev_ϕ(c) $\cap$ $\cap$MB(i,c,w) + ϕ]. The *tamyen*-conditional in (8c) is awkward because it violates the definedness condition in (24), i.e., the context set c already includes the worlds in which the antecedent is true and thus c plus the worlds of the antecedent equals c.

The counterfactual conditional in (9) has an empty modal base and a totally realistic ordering source.

(9) (in a context where the speaker knows that Mary did not come yesterday)

Mary-ka	ecey	oass	{ -**umyen** / -**tamyen** }	te	caymi-ka	issessultheyntey	
Mary-NOM	yesterday	came-COND		more	fun-NOM	exist	

'If Mary had come yesterday, (we) would have had more fun.'

The value of $\cap$MB(i,c,w) is a set of all possible worlds. The value of [(rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)) + ϕ] is all possible worlds minus the worlds in which the antecedent *Mary-ka ecey oass* ('Mary had come yesterday') is not true. This set of worlds is further narrowed down by the totally realistic ordering source. The worlds are ordered with respect to their being more or less near to what is actually the case in the world under consideration. Thus, the value of $CC_{OS(i,c,w)}$[(rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)) + ϕ] is the closest world(s) to the ideal world (what is known to be the case in w) in which the antecedent is true. (9) is true only when the consequent *te caymi-ka issessultheyntey* ('we would have had more fun') is true in the world(s) of $CC_{OS(i,c,w)}$[(rev_ϕ(c) $\cap$ $\cap$MB(i,c,w)) + ϕ]

In this section, it has been shown that the hybrid theory of Kratzer (1980) and Heim (1992) can account for the truth condition and the presuppositional satisfactions of Korean *(ta)myen*-conditionals. In the next section, I will show how this theory can account for the difference between indicative and counterfactual conditionals in English.

3.3 Presuppositional constraint on English conditionals

According to Karttunen and Peters (1979), an indicative conditional is used only when it is conventionally implicated that the antecedent is epistemically possible, whereas a counterfactual conditional is used only when it is conventionally implicated that the negation of the antecedent is epistemically possible. We can incorporate their observations into our approach. On our approach, the difference between indicative and counterfactual conditionals in English can also be accounted for by different presuppositional constraints on them, as done for Korean *tamyen*-conditionals. We can define the CCP of English conditionals as in (28), under the assumption that the context set is the same as the epistemic conversational background.[8]

(28) CCP for English conditionals
[(c + (*if* ϕ_{indic},ψ)) is defined iff c + $\phi \neq \emptyset$, and
(c + (*if* ϕ_{subjunc},ψ)) is defined iff c + $\neg\phi \neq \emptyset$]
Where defined,
$[c + \textit{if}\ \phi,\psi] = \{w \in c : CC_{\cap \text{MB}(i,c,w)}[(\text{rev}_\phi(c) \cap \cap \text{MB}(i,c,w)) + \phi] + \psi = \text{same}\}$

(28) states that an indicative conditional has a presupposition that the antecedent must be compatible with the context, whereas an counterfactual conditional has a presupposition that the negation of the antecedent is compatible with the context set. Note that (28) differs from the definition of Korean conditionals in (24) only in the definedness condition part which specifies the constraint on presuppositional satisfactions. This means the following: the truth condition (information updating part) of the conditionals of the two languages is the same, but the cross-linguistically or language-internally different kinds of conditionals in those languages only have different presuppositional requirements concerning the relationship between the antecedent and its context set.

[8]The assumption that the context set is the same as an epistemic conversational background is compatible with Stalnaker's (1979) common ground of a conversation. As already discussed in section 3.1, the common ground is a set of propositions which is mutually agreed upon among conversationalists. The conversationalists can agree upon only what they believe they know, i.e., those propositions which are established as knowledge for a group of people or a community.

4. Conclusion

In this paper, the syntax and semantics of Korean *(ta)myen*-conditionals were discussed. The syntactic structure of Korean conditionals was analyzed based on the GPSG framework. To account for the semantic contribution of the bound morpheme *(ta)myen*, a new semantically potent feature COND was introduced. Also semantic differences and similarities were explored among the several varieties of *myen*-conditionals, such as *tamyen-*, *tako hamyen-*, *tako hantamyen*-conditionals. It was shown that how the truth conditions and presupposition conditions of factual, hypothetical, and counterfactual *(ta)myen*-conditionals are determined in a hybrid theory of Kratzer's (1980) modal base/ordering source semantics and Heim's (1992) context change semantics. Also it was shown how this approach can be extended to the account of English indicative and counterfactual conditionals.

Finally, a problem will be pointed out that needs further study. It is not clear why *ta* in *tamyen*, which is usually analyzed as a declarative sentence ending marker, triggers the presupposition that the worlds of the proposition denoted by the antecedent cannot be a part of the worlds of the context set. We may say the similarity between *tamyen* and *tako hamyen* is responsible for this presupposition trigger, but there does not seem to be any principled reason for this. That is, if we assume that *tamyen* is a reduced form of *tako hamyen* by *-ko ha-*deletion (as claimed in Bak (1987)), then we may explain why *ta* in *tamyen* triggers the presupposition. However, a problem for this analysis is that there is no principled reason why *tako hamyen* cannot be reduced to *myen*, rather than *tamyen*, because a *tako hamyen*-conditional seems also to be an instance of a *myen*-conditional, as shown in section 2.

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Spanish *imperfecto* and *pretérito*: Truth conditions and aktionsart effects in a Situation Semantics

Alicia Cipria and Craige Roberts

§0 Introduction[1]

In this paper we have both a descriptive and a theoretical aim. The former consists in attempting to formulate truth conditions for the Spanish *pretérito* and *imperfecto* tenses and in identifying the implications they each have for the aktionsart of the resulting clause, so far as we know, this has not been addressed previously in the literature on Spanish. While aspect (imperfective/perfective) is related to aktionsart, they are distinct: Aspect is a grammatical notion, reflected in morphological distinctions such as that between *pretérito* (perfective) and *imperfecto* (imperfective), while aktionsart is a semantic notion, a classification of the events corresponding to clauses. As is often the case in human languages, there is no one-to-one correlation between the aspect of a given verbal form and the aktionsart of the corresponding event. We will argue that while the *imperfecto* will always entail atelic aktionsart in the interpreted utterance, the use of the *pretérito* will not necessarily result in telic aktionsart. We show that this follows from the truth conditions we suggest for these aspectual forms.

We will formulate these truth conditions in a situation semantics of the sort originally proposed in Kratzer (1989). The use of this framework reflects our second, theoretical aim, which is to begin to explore how to enrich this framework with a semantics for tense and aspect. Again, this is a subject which, so far as we know, has not yet been systematically explored, and, of course, the present study only represents a modest beginning. But it already presents some interesting problems which may be useful to keep in mind in subsequent work, whether on Spanish or other languages.[2]

In what follows, we first, in §1, give a brief overview of the traditionally observed meanings of the *pretérito* and *imperfecto*. In §2, we consider the associated aktionsarten. In §3 we offer our truth conditions, briefly discussing some of the relevant issues which

[1]This paper was presented in an earlier form at the Georgetown University Roundtable on Language and Linguistics, in the Presession on Spanish Linguistics, in March, 1995. We are grateful to Jae-Hak Yoon, Andreas Kathol, David Dowty, and Paul Portner for helpful discussions on various points.

[2]See Cooper (1986) for an earlier discussion of (English) tense within situation semantics.

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arise in introducing temporal factors into a situation semantics. And in §4 we consider how these truth conditions account for the readings discussed in §1.

§1 Observed meanings of the *pretérito* and *imperfecto*

§1.1 *Pretérito*

The Spanish *pretérito*, exemplified by (1a) and (1b), is generally said to make an unambiguous contribution to the meanings of expressions in which it occurs, with a sense which is often said to be punctual, terminative, or definite.

(1) a. Llegó el tren.
arrive-3sg.PRET the train
'The train arrived.'

b. Teresa cantó en el teatro.
Teresa sing-3sg.PRET in the theater
'Teresa sang in the theater.'

The terminative character seems to reflect the fact that events corresponding to *pretérito* clauses are taken to have an end, e.g. in (1a), the train's arrival is a culmination, an end of the trip. When definiteness is invoked, the point seems to be that the entire event is referred to, as opposed to some indefinite subpart; hence, e.g., (1b) might be taken to refer to the entire event of Teresa's singing in the theater, as opposed to some subevent of her singing there. We will argue that these senses are captured by a requirement that the event(s) corresponding to a *pretérito* clause have a definite termination point, or 'end-point, in contrast to the events corresponding to *imperfecto* clauses. The relationship to the terminative sense is obvious and direct, that to the definite and punctual senses less so, mediated by aktionsarten. The *pretérito*, unlike the *imperfecto*, may denote a telic aktionsart; this aktionsart in turn entails the definiteness, in the relevant sense, of the event in question; and it influences the way that a Reference Time is established in discourse and leads to the impression that the corresponding event is viewed as punctual relative to other events under discussion. We'll review how these effects arise below.

§1.2 *Imperfecto*

Traditional discussions of the *imperfecto* propose various meanings for different tokens, including progressive, habitual, and intentional; hence at first glance it appears to be ambiguous. The *imperfecto* is often said as well to convey a durative, continuous, or indefinite sense: durative, as opposed to the punctual sense of the *pretérito*, continuous as opposed to the terminative character of the *pretérito*, and indefinite in the sense that some nonspecific subpart of the event is referred to, in contrast to the *pretérito*, which refers to the event in its entirety.

To illustrate the different senses of the *imperfecto*, consider (2a). Its different possible interpretations may be suggested by the context, or by modifying adverbials like those in (2b–d):

(2) a. Íbamos a la playa.
go-1plu.IMPF to the beach
'We went/ were going/used to go to the beach.'

The temporal adverbial clause in (2b) suggests a progressive reading:

(2) b. Íbamos a la playa cuando nos encontramos con Miguel
go-1plu.IMPF to the beach when RECPR meet-1plu.PRET with Miguel
'We were going to the beach when we ran into Miguel.' (progressive)

The adverbial *los domingos* in (2c) suggests a habitual reading.

(2) c. Íbamos a la playa los domingos.
go-1plu.IMPF to the beach on Sundays
'We went/used to go to the beach on Sundays.' (habitual)

In (2d) the "intention-in-the-past" reading is clear.

(2) d. Hasta ayer, íbamos a la playa de vacaciones,
until yesterday go-1plu.IMPF to the beach on vacation

pero hoy Pepa dijo que no hay dinero para eso.
but today Pepa say-3sg.PRET that not there is money for that

'Up until yesterday we were going to the beach on vacation but today Pepa said that there is no money for that.' (intention-in-the past)

Examples like those in (4), patterned after the English example due to Dowty (1987) in (3), help to clarify the distinction between the progressive and the intentional readings:

(3) Lee was going to Radcliffe until she got accepted by Parsons.

(4) a. Laura iba a Radcliffe hasta que Parsons la aceptó.
Laura go.IMPF to Radcliffe until Parsons her accept.PRET
'Laura was going to Radcliffe until Parsons accepted her.'

b. Laura estaba yendo a Radcliffe hasta que Parsons la aceptó.
Laura be.IMPF going to Radcliffe until Parsons her accept.PRET
'Laura was going to Radcliffe until Parsons accepted her.'

c. Laura iba a ir a Radcliffe hasta que Parsons la aceptó.
Laura go.IMPF to go to Radcliffe until Parsons her accept.PRET
'Laura was going to go Radcliffe until Parsons accepted her.'

(4a) is ambiguous between the two types of readings. (4b), with a past progressive, is synonymous with the progressive reading of (4a), while (4c), with the periphrastic future *ir a*, is synonymous with the intentional reading. Note that one of these readings might be true while the other is false, underlining their non-synonymity. For example, for (4b) to be true, Laura must already be at Radcliffe when she learns that Parsons has accepted her, while this need not be the case with (4c).

There is another meaning which the *imperfecto* is sometimes said to have, the iterative; we will illustrate this further below. The iterative and the three meanings for the *imperfecto* that we have just examined all have two things in common. First, they involve reference to a past time. Second, they display atelic aktionsart, a notion which we turn to now.

§2 Aktionsarten and the *imperfecto* and *preterito*

We assume a truth conditional semantics in which sentences denote propositions, where propositions are classically taken to be sets of worlds or situations. But it has long been clear to those who work on tense and aspect that sentences and the clauses they consist of allude as well to the existence of various kinds of events or states. In §3, we will discuss how the propositions expressed by clauses are related to these events or states. For the moment, it suffices to acknowledge the correlation.

The aktionsarten constitute a classification of eventualities, where eventualities are either events or states. By extension, one talks of the aktionsart of a given clause on the basis of the aktionsart of the event or state correlated with the proposition it expresses. And we often talk of the aktionsart of predicates, defined in terms of the aktionsart of simple clauses in which it occurs as main predicate. There are two major classes of aktionsarten: telic and atelic.[1] Thus, we often speak of the aktionsart of a given clause or predicate as its *telicity*. The characterization used here is that of Dowty (1979; 1987), who draws in turn on Kenny (1963).

Atelic aktionsarten may be states (e.g. *saber* 'know', *querer* 'want', *vivir* 'live') or processes (e.g. *correr* 'run', *llover* 'rain', *escuchar* 'listen'). In general, telic situations involve the achievement of a goal or some resulting state; they may be simple (e.g. *win the contest*) or complex (e.g. *write the dissertation*). There is one property that centrally distinguishes the atelic from the telic aktionsarten, which we call the **subinterval property**. Informally, we can say that if a state or process holds at some interval of time then it also holds at any subinterval of that interval, so that, e.g., if it is true at an interval of an hour that I know something, I also know it at any subinterval of that hour (**distributivity**). Also, its truth at the hour-long interval does not exclude the possibility that there may also be a super-interval, say of two hours, during which the same state or process is true (**cumulativity**). Dowty (1987) formally defines atelicity for predicates in terms of the subinterval property, as shown in (5):

(5) **The SubInterval Property for Atelic Aktionsarten**
If δ is an atelic predicate, then necessarily, $\delta(x_1,\ldots,x_n)$ is true for interval I if and only if $\delta(x_1,\ldots,x_n)$ is true for all subintervals I' of I.

The predicted entailments are illustrated for the process of running in (6):

(6) a. Jaimito corrió de 4 a 5.
Jaimito run.PRET from 4 to 5
'Jaimito ran from 4 until 5.'

b. Jaimito corrió de 4 a 4:30.
Jaimito run.PRET from 4 to 4:30
'Jaimito ran from 4 until 4:30.'

Because the interval from 4 to 4:30pm is a subinterval of that from 4 to 5pm, the atelicity of *correr* is reflected in the fact that (6a) entails (6b) (distributivity). Similarly, this permits us to say that if Jaimito runs during the period from 4 to 5pm and also during the period from 5 to 6pm, it is also true that he runs from 4 until 6pm (cumulativity).

Telic aktionsarten do not have the subinterval property, and in fact if a telic event is true at an interval, none of its proper subintervals will verify an instance of the same type of event. Thus, we can only say that a telic like (7) is true at the maximal interval which it took for Jaimito to write the poem in question.

[1] These terms were first introduced by Garey (1957).

(7) Jaimito escribió un poema.
Jaimito write.PRET a poem
'Jaimito wrote a poem.' (telic)

If (7) is true at an interval i, we cannot say that it is true at any subintervals of i, at least for the same poem (though of course, the progressive version of (7) or its English counterpart may be true at a subinterval of i). From this it also follows that if (7) is true of the interval from 4 to 5pm and then again of the interval from 5 to 6pm, it is not true at the interval from 4 to 6pm, though we could say that it is true at the larger interval that Jaimito wrote two poems.

Dowty (1987) formally defines telicity as in (8):

(8) If δ is a telic predicate, then the truth of $\delta(x_1,\ldots,x_n)$ for interval I entails that $\delta(x_1,\ldots,x_n)$ is false for all proper subintervals I' of I.

The telicity or atelicity of a clause is not determined by its verb alone. Rather, the presence of certain argument NPs, adverbial phrases, or aspectual markers on a verb can yield a different aktionsart from the one suggested by the verb in isolation. To see how non-verbal elements contribute to aktionsart, observe that often in English sentences with a simple past tense verb, an argument NP whose head is a count noun will yield telic aktionsart for the whole clause, whereas a mass NP will yield atelicity; this is illustrated in (9a) and (9b).

(9) a. Oil flowed through the pipes. (atelic)
b. 3000 liters of oil flowed through the pipes. (telic)

(9a) may be true both at an interval i and at subintervals of i. But on at least one reading of (9b), which may be the easiest reading to access out of the blue, if it is true at i, then though (9a) will be true at subintervals of i, (9b) itself will not be true at those subintervals. The measure phrase in (9b) sets the boundaries on the event's duration: Once the measure is achieved, the event is completed, but not before.

The facts are somewhat different for Spanish, given the distinction between *pretérito* and *imperfecto*. The use of the *imperfecto* will always imply atelicity, while the *pretérito* will not necessarily imply telicity, as we already saw in (6) above. We claim that this should follow from the truth conditions associated with each of these verbal tense/aspect forms, so that in the case of the *imperfecto*, atelicity is part of its core meaning. Thus, example (11) with an *imperfecto* verb and the count NP *3000 litros de petróleo* has the same aktionsart (atelic) as the proposition in (10), with the mass noun *petróleo*:

(10) Corría petróleo por las cañerías.
flow-3sg.IMPF oil through the pipes
'Oil flowed/was flowing through the pipes.' (atelic)

(11) Corrían 3000 litros de petróleo por las cañerías.
flow-3pl.IMPF 3000 liters of oil through the pipes
'3000 liters of oil flowed through the pipes.' (atelic)

Examples (10) and (11), like (9a), are atelic because if one of them is true at an interval i, it is true to say of any given subinterval of i that oil (in the case of (11), 3000 liters of it), was flowing at that subinterval. To imagine when (11) would be true at an interval i, suppose we have a circular pipe that can hold exactly 3000 liters and oil keeps flowing

around in it continuously; then it is true for a given subinterval of i that "3000 liters of oil were flowing" during that subinterval. Also, (10) and (11) have a habitual reading, even without an adverb such as *diariamente/por día* 'daily/per day'. In the proper context or with an appropriate adverbial modifier, (9b) can have this habitual reading as well. In retrospect, we can see that (9b) may also have the non-habitual reading of (11); however, unlike (9b), (11) has no telic reading.

The examples with the *imperfecto* which we considered earlier were all atelic. So, in (2b) the subsituations of the event of "going to the beach" are instances of "going to the beach" as well. (2c) says that it was a habit of ours to go the beach on any normal Sunday during some past period of time; it entails that our having this habit would also be true of any subperiod of that period. Notice that this does not rule out the possibility that on one Sunday during that period we didn't go to the beach, for example because we had to attend a meeting or we were sick, since with the habitual we are dealing with what was the typical or usual case. With the intentional reading illustrated by (2d), the intention to go to the beach holds over some past interval, and also, then, over any subinterval of that interval.

But the *preterito* is, as noted, compatible with either aktionsart. In (12), with the *preterito* and the mass NP argument *petróleo*, the proposition has atelic aktionsart (cf. (9a)). The measure phrase in (13) interacts with the end-point requirement of the *preterito* (and the meaning of the predicate) to entail telicity.

(12) Corrió petróleo por las cañerías.
flow-3sg.PRET oil through the pipes
'Oil flowed through the pipes.' (atelic)

(13) Corrieron 3000 litros de petróleo por las cañerías.
flow-3plu.PRET 3000 liters of oil through the pipes
'3000 liters of oil flowed through the pipes.' (telic)

Like (9a), (10) and (11), example (12) has an atelic reading because it is true to say of any given subinterval of the flowing process that oil was flowing at that subinterval. (13) has a telic interpretation, with the same sense as the telic reading of (9b). If it is true at some past interval i that 3000 liters of oil flowed non-circularly through the pipes at i, then it is not true that 3000 liters of oil flowed through the pipes at any subinterval of i; instead only some part of the 3000 liters flowed during any subinterval of i.

Like (9b), (13) can have a habitual, i.e. atelic, interpretation as well in the proper context, but the point here is to contrast it with (11), which does not have a telic reading. Uttered out of the blue, the telic reading of (13) is the default. We take this to be pragmatically motivated: since the *imperfecto* can have only the atelic reading, when that is the meaning the speaker wishes to convey the use of the *imperfecto* is less likely to lead to a misunderstanding than that of the often telic *preterito*. Among others, Horn (1984a, 1984b) has argued that when we have two elements in a paradigm, one unmarked for some feature and the other marked, the use of the unmarked element will tend to take on the interpretation which is not possible for the marked element; he illustrates this with a number of lexical items and argues that it is motivated by Gricean principles, principally the Maxim of Quantity, which would lead the cooperative speaker to use the more informative marked form if it were applicable. We would argue that the default character of the telic interpretation of the *preterito* is another instance of the sort of phenomenon that Horn has discussed: the *preterito* may display either aktionsarten and hence is the unmarked element, while the *imperfecto* may only lead to an atelic interpretation, so that it is marked. Hence, by the maxim of Quantity, there is a tendency to interpret the *preterito* as telic if the *imperfecto* could have been used instead to unequivocally yield

the atelic. However, in certain contexts, partly because of the discourse effects of the *pretérito* vs. the *imperfecto*, to be discussed in §3.3.2 below, the *pretérito* may be preferred even though an atelic interpretation is intended. For example, we might utter (13) in the following context:

(13') Normalmente, corrían 1500 litros de petróleo por las cañerías, pero una vez,
usually flow-impf liters of petroleum through the pipes but one time

en 1985, a causa de un desperfecto, corrieron 3000 litros de petróleo (por las
in due to a malfunction flow-pret liters of petroleum through the

cañerías) hasta que se solucionó el problema.
pipes until solve-pret the problem

'Usually, 1500 liters of oil flowed/were flowing through the pipes. But once, in 1985, due to some malfunction, 3000 liters were flowing (through the pipes) until the problem was solved.'

Here, the *pretérito* form *corrieron* has an atelic reading. The possibility of contextually overriding the default in (13), argues that the tendency for a telic interpretation of the *pretérito* is indeed only pragmatic, a Gricean conversational implicature, and not part of its truth conditional semantics.

The examples in (15) illustrate how the temporal adverbials *por una hora* and *en una hora*, like their English counterparts *for an hour* and *in an hour* in (14), may also affect aktionsart.

(14) a. Frida rehearsed the libretto for an hour. (atelic)
b. Frida rehearsed the libretto in an hour. (telic)

(15) a. Frida ensayaba el libreto por una hora.
Frida rehearse IMPF the libretto for an hour
'Frida used to rehearse/was rehearsing the libretto for an hour.'
(atelic: habitual or progressive)

b. Frida ensayaba el libreto en una hora.
Frida rehearse IMPF the libretto in an hour
'Frida rehearsed/used to rehease/was rehearsing the libretto in an hour.'
(telic: inchoative; or atelic: habitual, progressive, or intentional)

c. Frida ensayó el libreto por una hora.
Frida rehearse PRET the libretto for an hour
'Frida rehearsed the libretto for an hour.' (atelic: iterative or progressive)

d. Frida ensayó el libreto en una hora.
Frida rehearse PRET the libretto in an hour
'Frida rehearsed the libretto in an hour.' (telic)

It is argued in the literature on English that *for an hour* requires that its argument, the clause within its scope, be atelic in aktionsart, while *in an hour* requires telic aktionsart. English *Frida rehearsed the libretto* may be within the scope of either adverbial, because it is indeterminate with respect to aktionsart, yielding either a telic reading as argument for *in an hour* (where the complete rehearsal takes place) or an atelic argument for *for an hour* (where the libretto was worked on without necessarily getting through the entire piece). If the Spanish counterparts to these adverbials work similarly, we predict that the atelic *imperfecto* may occur with *por una hora* 'for an hour' to yield the habitual or

progressive readings in (15a), and that the *pretérito* can yield whatever aktionsart is required for the adverbial, i.e. either atelic reading for *por una hora*, or else telic for *en una hora* 'in an hour'. But we correctly predict that the *imperfecto* in (15b) cannot occur with *en una hora* to yield the telic reading we find in (15d).

The telic interpretation noted for (15b) might appear to be a counterexample to the generalization that the *imperfecto* always yields atelic actionsart. However, this reading does not share the truth conditions available for (15d), where the entire rehearsal took one hour. In general, when a telic adverbial like *en una hora/in an hour* occurs with an atelic clause, one way of making the result felicitous is to shift to an inchoative interpretation, where the endpoint of the hour period marks the beginning of the process or state corresponding to the atelic clause—here, the process of rehearsal. We can see this in English if we give *in an hour* wide scope over the progressive, which is always atelic.[4]

(14) c. Frida was rehearsing the libretto in an hour. (telic: inchoative)

Since the only telic reading available for (15b) is the inchoative, the *imperfecto* patterns with the atelic English progressive, as expected. The other readings available for (15b) may be accounted for by assuming that in them the adverbial takes as its argument the tense/aspectless *ensayar el libreto*, which is indeterminate with respect to aktionsart, like its English counterpart; the *imperfecto* then applies to the resulting clause to yield atelic aktionsart.

The preceding discussion would suggest that (15d) has the same atelic readings as those noted for (15b). These readings do not seem to be available. We would offer, again, a pragmatic explanation for this fact, i.e. that the availability of the unambiguously atelic *imperfecto* strongly favors it over the ambiguous *pretérito* in such cases.

An endpoint adverbial such as *to the store/a la tienda* may similarly suggest telic aktionsart, as illustrated in (16–17), but this effect is overridden by the *imperfecto* in (18), which has only an atelic (habitual or progressive) interpretation.

(16) Juana ran to the store. (telic)

(17) Juana corrió a la tienda.
Juana run PRET to the store
'Juana ran to the store.' (telic)

(18) Juana corría a la tienda.
Juana run IMPF to the store
'Juana ran/was running to the store.' (atelic: habitual or progressive)

Summarizing, it is interesting to note that the use of the *imperfecto*, with at least three attested meanings (progressive, habitual, and intentional), always results in a single aktionsart, the atelic; while the *pretérito*, with an apparently unitary meaning, can display either telic or atelic aktionsart. This will follow from our truth conditions, to which we will turn in the next section.

First, though, let us be more precise about what we mean when we say that a given clause, or the proposition it denotes, displays telic or atelic aktionsart. In Dowty (1979) and subsequent work on English tense and aspect, it is assumed that aspectual markers like the Progressive have scope independent of the scope of tenses like the Past or

[4](14c) also has an habitual reading, of course. The inchoative is the only interpretation when the adverbial *in an hour* is sentence initial.

Present. E.g., in Dowty the Progressive has VP scope, while tenses have sentential scope. This assumption is crucial to the treatment of aktionsart in English, e.g. in the English (14b), repeated here:

(14) b. Frida rehearsed the libretto (in an hour).

Consider the usual truth conditions for such a sentence: The Past tense leads to a shift in the course of interpretation from the Speech Time to a time which is past relative to the Speech Time; call this past time the Event Time, following Reichenbach. The sentence will be true at the Speech Time iff there is a past Event Time at which 'Frida rehearse the libretto' is true. Note that (14b) will also be true for any subinterval of the Speech Time, since the Event Time which makes 'Frida rehearse the libretto' true in the past relative to the Speech Time will be past relative to subintervals of the Speech Time as well. Hence, if we consider the Speech Time and its subintervals, (14b) appears to display the SubInterval Property for Atelic Aktionsarten given in (5) above. But (14b) is intuitively telic, as reflected in the acceptability of the optional telic PP *in an hour*. As suggested above, this adverbial is telic because it requires that its argument be telic. Since only the proposition evaluated relative to the Event Time is technically telic, and not that evaluated at the Speech Time, this means that the adverbial must take narrow scope relative to the Past tense, so that the shift from the Speech Time to the Event Time will have already taken place.

In the English progressive counterpart of (15a), *Frida was rehearsing the libretto for an hour*, the PP adverbial is taken to have narrow scope relative to the Past tense, but it may either take wide or narrow scope relative to the progressive *-ing*. If we give the adverbial wide scope over the progressive, the truth conditions require that there was actually one hour of rehearsal (though the whole libretto may not have been rehearsed); with narrow scope, the (presumably intended) hour of rehearsal may not have been completed. With either scope, the whole atelic proposition *Frida be rehearsing the libretto for an hour* then serves as argument to the Past tense.

Similarly, although we may speak of the telicity of any predicate or clause, in the discussion of the *imperfecto* and *pretérito* examples in (10–13), (15) and (17–18) above, the telicity in question pertains to Event Times, and not to the time of evaluation for the examples. But in Spanish this leads to a problem for compositionality. E.g., in (15a), the *imperfecto* contributes both Past tense and habitual or progressive aspect:

(15) a. Frida ensayaba el libreto por una hora.
Frida rehearse.IMPF the libretto for an hour
'Frida used to rehearse/was rehearsing the libretto for an hour.'

In order to characterize the sense in which the *imperfecto* is atelic, we must talk about the habitual or progressive past event, i.e. telicity is determined with respect to material under the scope of the Past tense. But unlike English, in languages like Spanish the tense and aspect may be combined in one morphological form, as is the case in the *imperfecto*. In order to explain the aktionsart properties of *por una hora* and to derive all the possible readings for examples like (15a), the PP must take scope which is *internal* (cf. Dowty 1979:250ff) to the lexical meaning of the *imperfecto*, i.e. having narrow scope with respect to the tense contribution of the *imperfecto* but wide scope with respect to the aspectual contribution. While this can be accomplished technically, as we will show in the following section, it illustrates a whole range of problems with adverbials in various languages, problems which surely deserve a deeper insight into the semantics of adverbials than we can provide here.

§3 A truth conditional account of the semantics of the *imperfecto* and *pretérito*

§3.1 Eventualities and situations

Most previous truth conditional characterizations of the aktionsarten have assumed a possible worlds semantics with temporal primitives which are either intervals, as in Dowty's definitions (5) and (8) above, or events (or eventualities), as in Hinrichs (1985). Hinrichs characterizes atelic eventualities in terms of the cumulative property: they are those eventualities such that two of the same type, such as two eventualities of running, join to give a third, combined eventuality of the same, running type. Telic eventualities never display this property. Hinrichs' approach, thus, is an event analogue to Dowty's definitions of aktionsarten in terms of intervals. When we switch to a situation semantics, we need to address the relationship between intervals, events and situations. Portner (1992) offers a detailed analysis of the English progressive aspect in a situation semantics. He suggests, without argument, that we view an event as a situation, a situation which is minimal in that it includes all and only the participants in the event and verifies that they stand in the appropriate relations entailed by that participation but no others.

> A situation is a **minimal situation** in which e runs iff it contains nothing irrelevant to the truth of *e runs*, in the sense that if any part of it were taken away, we would say that we no longer had the whole of e's run anymore. It will therefore be a rather abstract situation. [Portner 1992:61]

He then follows Kamp (1979) in giving temporal relations between events directly in the model, so that we needn't take intervals to be primitive. We will follow Portner in viewing events as minimal situations, but he does not address the question of how to characterize the aktionsarten in these terms. Here, we briefly note a couple of the central issues involved and suggest one path to resolving them.

In Kratzer's situation semantics, a situation is a partial world, and a part-of relation is defined over the set of all situations. In what follows, $s \leq s'$ iff situation s is a proper part of situation s'; the relation $\leq$ is the super-relation of $<$ which admits of equality as well; $>$ and $\geq$ are their inverse relations, as usual. Since Kratzer doesn't treat tense or time, the part-of relation between situations is presumably based at least partly on spatial partiality, as well as perhaps other more abstract properties. Each situation is part of one and only one possible world, with the latter a maximal situation, i.e. one which is part of no other situation. If we extend this conception to consider time, we have world histories instead of worlds. Their parts, the situations, intuitively have two dimensions, a spatial extension and a temporal extension.[5] If situation s is a proper part of situation s', then s is presumably a proper spatial part and/or a proper temporal part of s'. In a temporally extended situation s, not only may entities have properties, but things may happen, i.e. change, as well, so that the properties which entities in s have in its initial subsituations may differ from those they have in its final subsituations. Such a situation sounds very much like an event, especially if we follow Portner in abstracting away from extraneous entities and simultaneous occurrences to make s minimal with respect to the realization of some type of event.

An event semantics along the general lines of the theory in Hinrichs (1985) uses quantification over events in the object language. If we assume, following de Swart (1992) and contra Kratzer (1988), that in such a semantics all predicates, both stage-level and individual-level, carry an event argument, and further, if we take events to be a type of situation, then this quantification over events amounts to quantification over situations.

[5] It is conceivable that there are other, more abstract dimensions of a situation, but we won't consider that possibility here.

But then, in a situation semantic framework of the sort assumed here, we can get much the same semantics without object language event quantification. This is because the situation of evaluation for a given clause plays the role of a witness situation (the event or its super-situation) for such a quantification. That is, the truth of the expression in the situation of evaluation entails the existence of a verifying situation, obviating the need to assert its existence in the object language.

In classical Montague Grammar (e.g. Montague 1973), natural language constituents are interpreted relative to an *index of evaluation* which includes both a world, and a time (now generally assumed to be an interval); we'll call the latter the *time of evaluation*. If we use a temporally extended situation instead of a world as a parameter of the index of evaluation for a constituent (call this parameter the *situation of evaluation*, or **EvalS**), we need to consider what relationship the temporal extension of that situation should have to the time of evaluation (the **EvalT**, an interval). Note that there must be some restriction on the relationship between the EvalS and the EvalT. What would it mean to interpret an utterance relative to an EvalT which was not a subinterval of the temporal extension of the EvalS? Surely something cannot be true in a situation at a time other than that of the situation itself. And super-intervals of the temporal extension of EvalS won't do either, as they might crucially include entities or eventualities which are not in EvalS. Let us define a function on situations, **Time**, which assigns to each situation its temporal extension, an interval. We don't want to say that Rosa built a house in situation s if it took longer than *Time(s)* to build the house. We can say she was building the house during s, but that's not the same, of course. So, if we have an independent EvalT, we need to guarantee that for all EvalT, EvalS, EvalT $\subseteq_t$ Time(EvalS), where $\subseteq_t$ is the temporal subinterval relation on pairs of intervals. But this, in turn, suggests that we might manage without the EvalT and this ad hoc stipulation if we use Time(EvalS) in place of EvalT in our interpretation. That is, the temporal extension of the situation of evaluation now serves intuitively as the Event Time of the eventuality described.

We can either assume that our model has intervals as primitive elements, with temporal relations defined over them and hence indirectly over situations in terms of their value under Time; or else, following Portner (1992), we can assume that situations have temporal relations defined directly over them. In the latter case, we can define times and intervals, if we need them, in terms of the temporal relations over situations; again, this would follow Kamp's (1979b) definition of times and intervals in terms of primitive temporal relations over events. The way we model temporal relations over situations doesn't matter here, so we won't choose between these approaches. Whether we take times to be primitive elements of the model or defined, they can serve as the value of the function *Time* over situations. In either case, we will want to guarantee that the temporal dimension of a situation, as captured by the *Time* function, corresponds to our intuitions about the relationship between situations and their temporal extensions. Among other things, we will want the following to be true:

(19) For all s, s', if $s \leq s'$, then Time(s) $\subseteq$ Time(s').

I.e., if s is a sub-situation of s', then their times are appropriately related as well.

One more difficulty remains. Kratzer (1989) argues that propositions ought to be persistent, in order to get the correct semantics for counterfactual conditionals. As usual, a proposition is a set of situations, those in which it is true:

(20) **Persistence in Situation Semantics** [Kratzer 1989:616]
A proposition $p \in P(S)$ is *persistent* iff for all s and $s' \in S$ the following holds:
Whenever $s \leq s'$ and $s \in p$, then $s' \in p$.

What this means is that if a proposition is true in a situation s, then it must be true in all the supersituations of s, including the maximal situation, or world, w_s, of which s is part. Assuming that Kratzer's argument is sound, then we will want to require persistence of propositions in our situation semantics enriched with times, as well. The problem is that if we require persistence of propositions and take the primitives in terms of which we define aktionsarten to be situations instead of primitive events or intervals, then we must take care to avoid imposing conflicting requirements on the interpretation of clauses, arising from their telicity and persistence.

To see the problem, consider how we might define the aktionsarten in such a framework. First we consider the preliminary, simple definition of atelicity in (21):

(21) A clause (or formula) ϕ expresses an atelic proposition iff for all situations s, $[[\phi]]^s = 1$ iff for all $s' \leq s$, $[[\phi]]^{s'} = 1$.[7]

Since the set of situations which are parts of s will include those which are temporal parts of s, (21) might seem to capture Dowty's subinterval property for atelic aktionsarten in (5), the latter defined in terms of the intervals at which certain (atelic) predicates hold of a set of arguments.

(5) **The SubInterval Property for Atelic Aktionsarten**
If δ is an atelic predicate, then necessarily, $\delta(x_1, ..., x_n)$ is true for interval I if and only if $\delta(x_1, ..., x_n)$ is true for all subintervals I' of I. [Dowty 1987]

Now suppose we try to extend this approach to develop the analogue of Dowty's (8) in situation semantic terms, as in (22):

(8) If δ is a telic predicate, then the truth of $\delta(x_1, ..., x_n)$ for interval I entails that $\delta(x_1, ..., x_n)$ is false for all proper subintervals I' of I. [Dowty 1987]

(22) A clause (or formula) ϕ expresses a telic proposition iff for all situations s such that $[[\phi]]^s = 1$, for all $s' < s$, $[[\phi]]^{s'} = 0$.

(22) does mirror (8), but if we require persistence of propositions, this will mean that there can be no telic propositions. For persistence requires that if $[[\phi]]^s = 1$, then for all s'' such that $s < s''$, $[[\phi]]^{s''} = 1$. So long as s isn't a world history (and recall that Portner assumes that events are minimal situations, which won't be world histories in any reasonably realistic model), persistence would entail that ϕ is true in both a situation, s'', and its subsituation s, precluding telicity as defined in (22).

Further, consider a clause ϕ, of the form *María tomó/tomaba cerveza*, 'María drank beer', atelic by the usual tests (again, considering the Event Time of María's drinking, and not the Speech Time). Suppose that this is true by virtue of the fact that María is drinking beer in some past situation s, which is not itself a world history, and that she is drinking beer in all of the subsituations of s, reflecting its intuitive atelicity; *Time(s)* will then be the Event Time of María's drinking. By persistence, María will also have to be drinking beer in the world history of which s is a part, w_s. But surely she wouldn't be drinking beer in all the subsituations of w_s. Even if she's a drunkard, María has to sleep

[7] This is a bit too strong. As Hinrichs (1985) discusses at length, even in relatively homogeneous eventualities, such as processes like walking, there are subeventualities which are so small that they are too small to identify as eventualities of walking; they might be identifiable as eventualities of lifting a foot or flexing a heel, but aren't sufficiently temporally extended to be differentiated from a standing in place and lifting one foot. We could modify (21) to take this into account, requiring that s' be sufficiently temporally extended to be a ϕ-ing, but for simplicity, we'll just ignore this refinement in this and subsequent definitions, as Dowty does in his interval-based definition of atelicity.

sometime'. But then Maria's drinking beer would be true of a situation, w_3, but not of all of its subsituations, so that the clause would *not* satisfy the definition of atelicity in (21). Hence, we could not reflect the atelicity of ϕ under (21) while maintaining persistence, without imposing a very unrealistic requirement on its truth in the model.

Finally, another problem with (21) is that it requires the truth of ϕ even in the subsituations of the past situation s which, while they may be in principle temporally extensive enough to contain ϕ-ings, are spatially radically smaller than s, to such an extent that they are too small to contain all of the individuals which play central roles in ϕ-ing. This is clearly too strong a requirement.

(23) retains the simple indexing schema argued for above, without temporal indices, while avoiding some of the pitfalls of (21). In it, **Space** is a function from situations to their spatial extensions; it is used to keep the spatial parameter stable while permitting the temporal to vary:

(23) **Atelicity in a Situation Semantics**
A clause (or formula) ϕ expresses an atelic proposition iff for all situations s, $[[\phi]]^s = 1$ iff there is an $s' \leq s$ such that $[[\phi]]^{s'} = 1$ and for all $s'' \leq s'$ such that $\text{Space}(s'') = \text{Space}(s')$, $[[\phi]]^{s''} = 1$, as well.

Here, s' intuitively plays the role of Portner's event at which ϕ is true, though we haven't directly required that it be an event in his sense; rather, the existence of a ϕ event, which might be a subsituation of s', is entailed by (23). By (23), if ϕ is true at s, it is true at w_3 as well, guaranteeing persistence. But we don't thereby require its truth at all subsituations of w_3, any more than its truth at all subsituations of s itself; hence, atelicity is compatible with persistence. The role of Event Time is implicitly played by Time(s'), the temporal extension of the eventuality corresponding to ϕ; Time(s') may well be a proper subinterval of Time(s).[7] Further, we only require the truth of ϕ in all of those subsituations of s' which are spatially co-extensive with s', not in those which are too small in some sense.

In order to define a corresponding notion of telicity, then because of persistence we first need to define (rather roughly) what it is for a situation to be a minimal situation in which a given event-type occurs. (24) adapts to a situation semantics with times Portner's (1992) notion of a *minimal situation* in which a proposition is true:

(24) A situation s is **ϕ-minimal** iff $[[\phi]]^{s,ST} = 1$ and all elements of the non-temporal dimension(s) of s are necessary to its being a ϕ-ing.

Hence, a ϕ-minimal situation should be viewed as a rather long, very thin space/time worm (cf. Cooper 1986, Kratzer 1989). Note that given an atelic proposition ϕ, a ϕ-minimal situation s will typically be such that proper subsituations of s are also ϕ-minimal situations (proper sub-worms of the super ϕ-minimal situation), in accordance with the distributivity required by (23). We will make use of this property to distinguish them from situations of a telic eventuality-type:

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[7] We also may need to assume that situations, like intervals, are temporally dense, which we do not find objectionable. Further, there is still the issue of the temporally minimal size at which an eventuality may be true. Suppose that an intuitively telic proposition happens to be true at a situation of temporally minimal size. Then it's the case that the proposition is technically atelic, because it's true at all the subsituations of that minimally-sized situation; there just don't happen to be any proper subsituations. This is undesirable. But note that (5) presents the same problems (and (21) as well). For if t happens to be the minimal interval that's temporally extended enough for ϕ to be true in it, then it's also trivially true that ϕ is true at all temporally minimally subintervals of t.

(25) **Telicity in a Situation Semantics**
A clause ϕ expresses a telic proposition iff for all situations s: if s is ϕ-minimal, then there is no s' such that $s' \neq s$ and $[[\phi]]^s = 1$.

Note that precluding subsituations of s in which ϕ is true entails that there are no temporally proper sub-situations of s at which ϕ is true.

Now consider the following:

(26) María tomó cerveza.
María drink.PRET beer
'María drank beer.'

(27) María tomó una cerveza.
María drink.PRET a.beer
'María drank a beer.'

Under Dowty's characterization of atelicity and telicity, intuitively (26) is atelic, (27) telic (under the scope of the past tense), judgments which are reflected in the acceptability of adverbials: atelic *por una hora* is fine for (26), odd with (27), while telic *en una hora* is fine for (27) but odd with (26). As in examples (9–13), this difference in aktionsart stems from the difference between a mass argument, *cerveza*, and a count argument, *una cerveza*, and not from the verb *tomar* or the *pretérito*, both of which are neutral with respect to aktionsart. Suppose we take the logical form of these examples to be as in (26') and (27'):

(26') PAST[$_\phi$ PRET-ASP [tomar (María,cerveza)]]

(27') PAST[$_\psi$ PRET-ASP [tomar (María,una cerveza)]]

By (23), if ϕ in (26') is true in a (past) situation s_1, then this will require the existence in s_1 of an atelic event of María's drinking beer, i.e. a subsituation s' of s_1 during all of whose spatially co-extensive subsituations she also drank beer. The object *cerveza* is a mass noun; hence whatever its denotation, the material parts of that denotation are also in the denotation of *cerveza* (see Link 1983)[8]. Thus, any temporal part of a period of drinking some maximal amount of *cerveza* will contain a proper part of that maximal amount which is also drunk (see Krifka 1986, 1987). Further, if it is true that María drinks beer in s_1, it will also be true in w_{s_1}, satisfying persistence, but she needn't be a drunkard, drinking beer at all the subintervals of w_{s_1} itself.

Suppose that (27') is true by virtue of two past beer drinking situations, so that ψ in (27') is minimally true in both s_1 and s_2, where $w_{s_1} = w_{s_2}$, but s_1 and s_2 are non-identical, temporally non-overlapping situations. Then by persistence, ψ is still true in $w_{s_1} = w_{s_2}$, i.e. it's true in that world history that Mary drinks a beer. This seems quite reasonable to us, even though we can also say that she drinks two beers in that world history (and in the join of s_1 and s_2, which is also part of it), that shouldn't mean that she doesn't also drink one. This is a problem, we think, for Dowty's definitions, according to which María couldn't be said to have drunk a beer at Times(w_{s_1}) or at the join of Times(s) and Times(s'). But under (25), as in Dowty's account, (27') still expresses a telic proposition, because (25) precludes the existence of a temporally proper subsituation s'' of either s_1 or s_2 during which time Mary drank a beer. It takes just so long to drink a beer; any less is a beer-drinking, but not the drinking of a beer. So the proposition expressed by (27') is non-atelic, as desired, though persistent.

[8] at least down to the level where there are sufficient molecules of the appropriate sort in solution

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We will henceforth assume the definitions of the aktionsarten given in (23) and (25), along with the simple indexing schema they presuppose.

§3.2 *Imperfecto*

§3.2.1 Truth conditions for the *imperfecto*

Our truth conditions for the *imperfecto* involve a single core meaning, given in preliminary form in (30) below; for simplicity, this definition ignores the issue of the *imperfecto*-internal scopes of temporal adverbials, discussed in §2 above, a deficiency which will be remedied below. What we offer is basically a modal interpretation of the *imperfecto*, as indicated by the universal quantification over worlds w'. It has two subcases, involving two possible types of domain restriction on the universal quantification; these are given in terms of permissible modal accessibility relations R in cases (a) and (b). Case (a) captures the progressive interpretation of the *imperfecto*, case (b) the habitual. We will argue in §4 that the other purported senses of the *imperfecto* are in fact subcases of one of these two.

(28) $s <_t s'$ iff s and s' are part of the same world and s temporally precedes s'

(29) ST = the Speech Time of an utterance, technically the situation in which it is uttered, whose temporal dimension then corresponds to the Reichenbachian notion of Speech Time.

(30) **Meaning of the *Imperfecto*** (Preliminary)
$[[\text{IMPERF}\phi]]^{s,ST} = 1$ iff
$\exists s' \subseteq w_s [s' <_t ST \;\&$
$\forall s''[R(s'',s') \rightarrow [[\phi]]^{s'',ST} = 1] \;\&$
$\forall s''[s'' \leq s' \rightarrow \forall s'''[R(s''',s'') \rightarrow [[\phi]]^{s''',ST} = 1]]]$,
where either:
(a) Progressive case: $R = \{ \langle s,s' \rangle : s$ is an inertia-situation for $s' \}$, or
(b) Habitual case: $R = \{ \langle s,s' \rangle : s$ is a characteristic subsituation of $s' \}$

The core import of (30) can be paraphrased as follows: IMPERFϕ is true in a situation s if and only if there is some situation s' (in the same world history as s) which is past with respect to the Speech Time (ST) and ϕ is true in every situation s'' which is related to s' in the appropriate fashion R. In addition, the truth of ϕ is preserved under R for the subsituations of s' as well; i.e. every subsituation s'' of s' must be such that all the situations s''' which are related to s'' in the same fashion R are also such that ϕ is true at s'''.[9] There are thus, in addition to the modal accessibility relation R, two parts of the meaning of the *imperfecto*: the Past tense, reflected in the requirement that s' be past relative to the Speech Time, and the atelic aspect, reflected in the additional assumption, the subinterval property required of s'. Requiring that s' be past relative to the Speech Time makes the Spanish *imperfecto* an *absolute tense*, in the sense that its temporal location is always determined relative to the Speech Time, even in embedded clauses; cf. Korean (Yoo, Yoon this volume) for an example of a language where embedded clauses are interpreted relative to the event time of their embedding clauses instead.

[9] We will not give a complete fragment for Spanish. We assume, as usual for tenseless ϕ, that $[[\phi]]^{s,ST} = 1$ iff ϕ is verified by s. E.g. for a basic formula, the arguments of the predicate must stand in the relation denoted by the predicate in s.

In (30a), we adopt a notion of the progressive modified from Dowty's (1979) definition. Crucial to this definition is the notion of an inertia situation, modelled after his notion of an *inertia world* ; cf. also Portner's (1994) *inertia events*. Intuitively, an inertia situation for a situation s is one which begins just like s, but continues in the way that s would continue were there no interference with the course of events as they have developed up to that point. Of course, in reality the course of events is often interrupted; e.g., Freda might be in the midst of baking a cake but receive a phone call and never finish it. So the progressive is in this respect like modality, in that it makes reference to possibly unrealized situations.[10] Further, we require that an inertia situation for a given EvalS continue on beyond Time(EvalS), the interval at which the progressive is asserted to be true.[11]

(31) **Constraint on the Inertia-Situation Relation**
For all s, if s' is an inertia-situation for s, then there is an s'' which is a temporally final subsituation of s' and which properly temporally follows s, i.e. which is such that $s <_t s''$.

Like the inertia-situation relation, the characteristic counterpart relation referred to in (30b) is modal, in the sense that they shift from one situation of interpretation to another; however, unlike inertia situations, characteristic subsituations of a given situation are all in the same world. This will follow from our definition if we assume, following Kratzer, that the subsituation relation holds only over situations in the same world. In this sense, the habitual reading has a realis character not displayed by the progressive. But not all subsituations of a situation s' are characteristic subsituations. The latter are subsituations which are normal or usual in some sense, a sense given by the meaning of the utterance in question and its context. With respect to (30b), since s is a subsituation of s', and hence they are in the same world, habitual readings are about what someone has actually done on typical occasions, and not, as with the progressive, about what would have been if things had gone on as they were.

Given these assumptions, the two subcases of (30) in (a) and (b) give rise to truth conditions which we can paraphrase as in (30a') and (30b'):

(30) a. Progressive
Imperfecto ϕ is true in a situation s if and only if there is an interval s' which is past relative to ST and ϕ is true at every inertia situation for s', as well as at every inertia situation for all the subsituations of s'. I.e., ϕ would have been true if things had gone on as they were.[12]

b. Habitual
Imperfecto ϕ is true in a situation s if and only if there is an interval s' which is past relative to ST and ϕ is true at every characteristic subsituation associated with s', as well as at every characteristic subsituation associated with the subsituations of s'.

[10] Abusch (1985) argues that in a treatment of the progressive along the lines of Dowty's (1979) we cannot make do with a single accessibility relation picking out inertia worlds, but rather that there might be different inertia worlds determined by various aspects of the situation described by the progressive. We will not consider this possibility here, but note that the relation R in our definition (30) might be modified to be a function which picks out accessibility relations on the basis of contextual factors, in order to reflect Abusch's modification of Dowty.

[11] The definition in (31) only works as desired if we assume that situations in different world histories are temporally comparable.

[12] By this, we intend no counterfactual implication. I.e., the truth of *imperfecto*ϕ is compatible with the subsequent truth of ϕ.

Since all the subsituations of s' must be such that their subsituations also have only inertia situations or characteristic subsituations that verify ϕ, this will guarantee that if ϕ is true at s', it will also be true at all its subsituations as well. This is just what we need to guarantee atelicity under (23). Hence, (30) entails that the *imperfecto* will always yield atelic aktionsart (under the scope of the Past tense).

We noted that (30) is preliminary in virtue of the fact that it ignores the internal adverb problem. We will propose a technical solution to this problem which involves leaving the translation of *Imperf* ϕ open to the introduction of adverbials with scope under the Past tense but wider than the aspectual portion of its meaning. We do this by changing the logical type of *Imperf* ϕ from that of a sentence, i.e. type t, to a function from adverbials to sentence-type objects.[11] As usual in Montague Grammar, ϕ' is the translation of the constituent ϕ into a formula of intensional logic, its logical form:

(32) **Meaning of the *Imperfecto*** (final)
IMPERFϕ' = λAdv[PAST(Adv[ASP$_{IMPF}\phi$])], where PAST, Adv, and ASP$_{IMPF}$ are of type t/t, and:
[[PASTψ]]^{s,ST} = 1 iff $\exists s' \subseteq w_s$ [$s' <_t$ ST & [[ψ]]$^{s',ST}$ = 1]
[[ASP$_{IMPF}\phi$]]$^{s',ST}$ = 1 iff
$\forall s''[R(s'',s') \rightarrow [[\phi]]^{s'',ST} = 1] \&$
$\forall s''[s'' \leq s' \rightarrow \forall s'''[R(s''',s'') \rightarrow [[\phi]]^{s''',ST} = 1]]$,
where either:
(a) Progressive case: R = { <s,s'> : s is an inertia-situation for s'}, or
(b) Habitual case: R = {<s,s'> : s is a characteristic subsituation of s'}

Under this translation and interpretation, *IMPERF* ϕ is of type $(t/t)/t$, taking a sentential adverbial, such as *en una hora* or *por una hora*, to yield an expression of type t. We could impose further, sortal restrictions on the adverbials which can serve as internal adverbs in this translation, but we won't investigate that here. In order to account for the possibility of iterating these adverbials, we can push up their type so that the adverbials take *IMPERF* ϕ' as argument, yielding an expression of the same type, $(t/t)/t$. In case the sentence takes no adverbials, we can use a dummy adverbial as argument to (32), basically an identity function. In such a case, the combined translation and interpretations of *PAST* and *ASP$_{IMPF}$* in (32) yield the same interpretation as the earlier (30). Note that the possibility of introducing adverbial meanings internal to the interpretation of the *imperfecto* does not preclude permitting the same adverbials to take narrower or wider scope than the *imperfecto*.

One final note: (30)/(32) do not guarantee that the situation s'' at which ϕ is true is itself in the past. The definition could be easily modified to ensure this. However, we have not done so because of intentional examples like (33):

(33) Juan dijo que venía mañana.
Juan said.PRET that come.3sg.IMPF tomorrow
'Juan said that he was coming tomorrow.'

In (33), the intended event of John's coming corresponding to the complement clause is specified to be realized, if at all, after the speech time. We will argue in the following section that intentional readings of the *imperfecto* are a type of progressive, so that all

[11] Dowty (1979:332ff) argues that aspectual adverbials like *in an hour* and *for an hour* should be VP adverbs, of type IV/IV. Notice that that is not open to us here: the scope of the tense portion of the meaning of the *imperfecto* is clearly sentential, type t, in the translation offered, and hence that of the aspectual potion of its meaning must be too. Hence adverbials taking intermediate scope between these two portions must take type t arguments (the result of adding the aspectual meaning to the basic clause meaning) to yield a type t argument for the tense portion of the meaning, i.e. be of type t/t.

readings of the Spanish *imperfecto* are covered by the cases given in (30)/(32) above. Given (33), then, we do not want to guarantee that s'' in (32) be in the past with respect to the time of evaluation (for (33), the Speech Time).

§3.2.2 Accounting for available readings of the *imperfecto*

Now let us return briefly to review the data in the first section, and show how our truth conditions for the *imperfecto* account for them. We have already discussed how the aktionsart for the *imperfecto* are constrained to be atelic. We also see that the progressive and habitual readings of the *imperfecto* are straightforward examples of cases (a) and (b) of (32), respectively. It remains only to discuss how the intentional and iterative readings of the *imperfecto* arise.

First, with respect to the intentional reading, note that we might try to derive it by adding a third clause to (32), as in (32c):

(32) c. Intentional
R≡ {<s,s,s''>: s is a situation realizing the intentions in s'' of the agent in s}

And placing the condition in (34) on the relation of being a situation (world-time pair) which realizes an agent's intentions:

(34) Constraint on the Intentional Realization Relation:
For all s, x, if s realizes someone's intentions in x, then there is an s'' which is a final-subinterval of s and which properly follows s', i.e. which is such that s' < s'', and the realization of the agent's intentions is concluded in s''.

However, apart from the problem of trying to define what it is to be the agent of a situation (which would surely require relativization to a particular event-type realized in that situation), we believe that adding (32c) is neither necessary nor sufficient to capture all the relevant readings, and that it is preferable instead to treat them as subcases of the progressive interpretation of the *imperfecto*. First, to see that such an addition would not be sufficient, notice that there are examples of a reading which is very close to the intentional but which does not involve an agent. This is exemplified by (35) and (36):[14]

(35) El mecanismo de autodestruccion se detonaba en 30 minutos.
The mechanism of self-destruction detonate IMPF in 30 minutes
'The self-destructing mechanism would be activated in 30 minutes.'

(36) Eran las 6. Los campesinos comenzaron a preparar el fuego.
be IMPF 6 the peasants start PRET to prepare the fire

El sol se ponía a las 6:50.
The sun 3-REFL set IMPF at 6:50

'It was 6 o'clock. The peasants started to prepare the fires. The sun would set at 6:50.'

But also, under certain assumptions about what constitutes an event, (32c) is just a subcase of (32a), i.e. the existence of such readings would be predicted by our truth conditions for the progressive. The main assumption we require is that an event may

[14] In the case of example (35), even though the presence of an agent is not explicit, one can assume that there has been some agent involved in the programming of the mechanism. In (36), however, no connection to an agent can be established.

consist not only of the changes in state typically associated with that type of event (see Dowty 1977), but also with what Moens & Steedman (1988) call a preparatory process: a subpart of the event before any culmination (of the change of state) occurs, during which the preparations for its occurrence are completed. If this assumption is made, then the *IMPF* ϕ might be true under the progressive reading if the preparatory phase of ϕ-ing is underway.

In a similar though not quite identical fashion, Partee (1984) discusses the possibility that, in order to derive the correct semantics for temporal adverbial clauses in examples like (37), we might think of an event of throwing a party as including not just the actual party, but also the planning, sending the invitations, preparing the food, etc.:

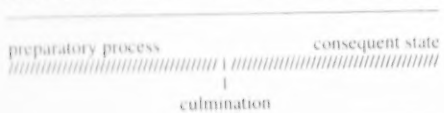
(37) When Juanita threw a party, she spent a long time preparing the food.

If we include the period during which one holds intentions to perform some act as part of the preparatory phase of an extended event, then the extended event is in progress during the preparatory phase, during the period when one holds those intentions. If one's intentions are carried out as planned, then in all the inertia situations corresponding to that period, the event itself will come about. From this perspective, the intentional readings are a subtype of the progressive. As is usual in the progressive, there is no assumption that the eventuality is fully realized. But the preparatory phase need not involve the intentions of a planner, yielding the intentional reading, but may instead simply reflect the fact that all the wheels are in motion which would ordinarily lead to an event like the sun setting, as in (36).

If intentional readings are subcases of the progressive interpretation of the *imperfecto* given in (32a), then we have to explain why the Spanish progressive does not give rise to such readings, as illustrated by the lack of an intentional reading in the past progressive counterpart to (3a) in (3b), discussed earlier. The fact that the Spanish progressive does not have the intentional reading supports our contention that the intentional reading arises from the meaning of the *imperfecto* itself, rather than, e.g., being the result of combining the *imperfecto* with a progressive operator (cf. Dowty's 1979 compositional treatment of the English futurate progressive in this way). Our understanding of the Spanish progressive is that in some sense it can only be used to refer to events when the change of state in question is actually in progress, though not yet complete.

To see what we mean, consider Moens & Steedman's suggested internal structure of telic events:

(38) Moens & Steedman's (1988) internal structure of a telic event ("Nucleus")



They argue that what the preparatory process involves might be interpreted differently for different examples, these differences arising, presumably, from real-world pragmatic knowledge plus the truth conditions of the examples involved. One type of construal would be where this process comprises the actual beginning of the change of state which leads to the culmination, as in the progressive reading of the *imperfecto* in examples like (2b), repeated here:

(2) b. Ibamos a la playa cuando nos encontramos con Miguel
go-1plu.IMPF to the beach when RECPR meet-1plu.PRET with Miguel
'We were going to the beach when we ran into Miguel.' (progressive)

But another would be where the preparatory process would comprise something like a planning phase, as in examples like (37) or, as we argued, the intentional readings of examples like (2d):

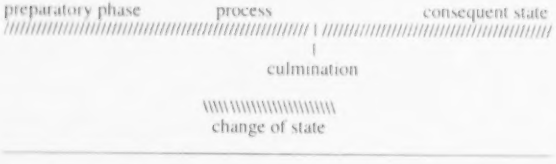
(2) d. Hasta ayer, íbamos a la playa de vacaciones,
until yesterday go-1plu.IMPF to the beach on vacation

pero hoy Pepa dijo que no hay dinero para eso.
but today Pepa say-3sg.PRET that not there is money for that

'Up until yesterday we were going to the beach on vacation but today Pepa said that there is no money for that.' (intention-in-the past)

But if the Spanish progressive is only felicitous in examples like (2b), and not in those like (2d), then some differentiation must be made between the two types of preparation for change of state. We seem to need something more like (39):

(39)



The culmination is point-like, i.e. temporally non-extended. In the complex telics (i.e. accomplishments), the change of state is more than the culmination; it is extended. We capture this by saying that there is a non-empty process leading to the culmination. In an achievement (simple telic), the process is empty. As a process of approaching the culmination, the pre-culmination portion of the change of state has a certain sort of homogeneity. But the preparatory phase is qualitatively different from the change of state, including the pre-culmination process, and hence isn't homogeneous with the process. In the preparatory process, nothing is going on which would concretely lead to the change of state. The Spanish progressive may only refer to the pre-culmination process of the actual change of state associated with a telic eventuality, after the preparatory process, if any.[15]

Note that this account of the intentional readings predicts that they may arise with achievements as well as accomplishments. This is confirmed by the acceptability of examples like the following:[16]

[15] It is interesting to note that English, with no distinct imperfective past tense form, uses the past progressive to indicate the intentional reading, as we see in the translations in the intentional examples in (2) – (4). This supports the idea that the restriction on the interpretation of the Spanish progressive is probably designed to take advantage of the *imperfecto* vs. past progressive split to make as many semantic distinctions as possible.

[16] We have chosen the complex achievement predicate *empezar el regimen*, with the inchoative aspectual verb *empezar*, because the intentional reading is generally easiest to get with agentive predicates, and, as Dowty (1979:124) notes, few, if any, simple achievement verbs involve agentivity.

(40) María empezaba el régimen el lunes. Pero hoy se enteró
María begin.IMPF the diet the Monday but today learn.PRET

que sus amigas le van a hacer una fiesta el lunes a la noche,
that her friends dat-3 go.PRES to make a party the Monday the evening

así que decidió no empezar hasta el otro lunes.
so decide.PRET not begin until the other Monday

'María was going to start her diet on Monday. But today she learned that her friends are going to throw a party for her Monday evening, so she decided not to start until the following Monday.'

Since we are not principally concerned here with the progressive, we will not explore how the ontology of event-parts sketched in (39) should be realized in the semantics. We only offer this here by way of tentative explanation of the difference between the *imperfecto* and the Spanish progressive.

At this point we would like to comment on the iterative interpretation often attributed to the *imperfecto* (cf. Binnick 1991) or considered as a subtype of the habitual (cf. Comrie 1976). English examples like (41) can only have iterative interpretations:

(41) Stephen kicked the door for ten minutes. (iterative)

(41) means that throughout a ten minute interval, Stephen repeatedly kicked the door. Spanish examples like (42) can have the same type of interpretation, but without the durative adverbial, in the appropriate type of context:

(42) Esteban pateaba la puerta.
Esteban kick.IMPF the door
'Esteban was kicking/used to kick the door.' (progressive or habitual)

We believe that the iterative interpretation of the *imperfecto* is a progressive interpretation, and furthermore, that the iterativity itself does not arise from the meaning of the *imperfecto*, but in another fashion. To see why, note that the obvious Spanish translation of the earlier English example (41) is (43), with the *pretérito*, not (44), with the *imperfecto*:

(43) Esteban pateó la puerta por 10 minutos.
Esteban kick.PRET the door for 10 minutes
'Esteban kicked the door for ten minutes.' (iterative)

(44) Esteban pateaba la puerta por 10 minutos.
Esteban kick.IMPF the door for 10 minutes
'Esteban used to kick the door for 10 minutes.' (habitual + iterative)

(45) Esteban pateó la puerta.
Esteban kick.PRET the door
'Esteban kicked the door.' (default interpretation: telic)

Standard accounts of the iterative interpretation of (41) assume that it comes not from the inherent meaning of *kick the door*, which is basically a simple telic, but from the necessity of reconciling this basic meaning with the durative adverbial *for ten minutes*, which only modifies an atelic event. Intuitively, since the duration of a kicking of a door is typically quite short and the associated event is telic, the only way to reconcile these two elements is to shift to an iterative interpretation of the main clause (resulting in

atelicity); a progressive interpretation would be odd because such an event ends almost immediately after it begins. Similarly, we would argue, in (43) the iterative interpretation comes not from the *pretérito* itself, which is compatible with the basic telic aktionsart of the predicate, but is a zero-morphological shift necessitated by the need to reconcile that telicity with the durative adverbial. Then also in (44), which generally is taken to mean that Esteban habitually kicked the door (repeatedly) for 10 minutes, it is not the aspect which forces the iterative interpretation, but the same combination of a telic predicate and a durative adverbial. The difference between the *pretérito* and the *imperfecto*, however, is that an example like (44) but without the adverbial, as in (42), can have a progressive interpretation in the proper context: 'Esteban was in the process of repeatedly kicking the door', whereas (45) without the adverbial does not have an iterative interpretation. Our treatment of the *imperfecto* as entailing atelicity predicts that the progressive interpretation of the *imperfecto* is like a durative adverbial in forcing a non-complex telic to have an iterative interpretation in order to be atelic. So, though the iterative interpretation is forced by the *imperfecto*, it is not part of the meaning of the *imperfecto* itself, but is just another instance of a general strategy for reconciling the telicity of the main predicate with the atelic requirements of an element with wider scope, be it an atelic adverbial or the atelic aspect. In turn, this also would correctly predict that the iterative reading can arise with the past progressive construction as well. But nothing in the meaning of the *pretérito* forces the shift to an iterative interpretation; in general, it seems that such shifts must be forced as in the *imperfecto* cases. Hence, the *pretérito* does not by itself yield iterative interpretations.

Finally, note that the purportedly durative and continuous aspectual character of the *imperfecto* are accounted for by the subinterval property associated with its atelicity: durative in the same sense that the compatible durative adverbials are (and also see the discussion of Reference Time in §3.3.2), continuous in that the subinterval property (here, more properly, a subsituation property) entails that there are no gaps in the eventuality concerned. We believe that the purported indefiniteness is really just by way of contrasting the *imperfecto* to a perceived definiteness of the *pretérito*, and has no independent content that we can determine.

§3.3 *Pretérito*

§3.3.1 Truth conditions for the *pretérito*

Presupposing the definitions in (46) and (47), (48) gives the truth conditions for clauses in the *pretérito*:

(46) s temporally overlaps s', $\mathbf{s} \circ \mathbf{s}'$, iff, there is a situation s'' such that
$s'' \leq s$ and $s'' \leq s'$.[17]

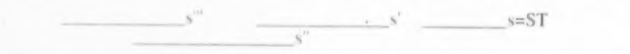
(47) 'Situation s is a temporally final sub-situation of situation s', $\mathbf{s} \leq_{\mathbf{final}} \mathbf{s}'$, iff
$\tau(s) \subseteq_t \tau(s')$ and there is no $s'' \leq s'$ such that $\tau(s) <_t \tau(s'')$.

(48) **Meaning of the *Pretérito*** (preliminary version)
$[[\text{PRET}\phi]]^{s,ST} = 1$ iff
$\exists s' \subseteq w_s[s' <_t ST \;\&\; [s' <_t s \vee s' \leq s] \;\&\; \phi\text{-minimal}(s') \;\&$
$\forall s''[s'' \circ s' \;\&\; \phi\text{-minimal}(s') \rightarrow$
$\forall s''_1[s''_1 \leq_{\text{final}} s'' \rightarrow$
$\exists s'_1[s'_1 \leq_{\text{final}} s' \;\&\; (s''_1 = s'_1 \vee s''_1 \leq_t s'_1)]]]]$

[17] This follows from the assumption about the relationship between subsituations and their times, (19) above.

PRETϕ is true in a situation s if and only if there is a situation s' such that (a) s' is prior to the Speech Time; (b) s' is either prior to s or else a sub-situation of s; (c) s' is ϕ-minimal; and (d) all ϕ-minimal situations s'' which overlap s' are such that all their temporally final subsituations either precede or are a temporally final subsituation of s'. The second disjunct of condition (b) makes persistence possible -- e.g., s might itself be w_s. We call condition (d) the **end-point requirement** of the *pretérito*. The *pretérito* permits past truth in overlapping situations and hence in supersituations, thus permitting atelic readings; but all these situations must end at a certain point, the end-point, which is intuitively the final moment of the largest ϕ-minimal situation. Note that (48) doesn't require truth in overlapping situations, so that telic readings are possible as well.

Note that (48) would permit *PRET*ϕ to be true in the situation s in the following diagram, where s', s''', and s'''' are all ϕ-minimal situations and the subsituation of s'' extending from the end of s''' to the beginning of s' is not a ϕ-minimal situation:



This is intuitively undesirable. However, note that in this case, ϕ would be neither telic nor atelic, by the definitions given in §3.1. Like those in Dowty (1979), those definitions fail to define a partition on the set of all possible propositions. We feel that this is appropriate; certainly it is possible to define a proposition in a predicate calculus which is neither telic nor atelic. Instead, the fact that all propositions expressed by natural languages are either telic or atelic is possibly a natural language universal of considerable interest, reflecting something about how we conceive of events and realize those conceptions in the lexical semantics for verbs and other predicate expressions. If so, it would be this natural language universal that would rule out the truth of *PRET*ϕ in the diagram described above, and no modification of (48) is required for this purpose.

As with the *imperfecto*, aspectual adverbials typically take intermediate scope between the tense portion of the meaning of the *pretérito* and the aspectual portion. Again, we will reflect this technically in our final definition by introducing an adverbial argument with intermediate scope, without pretending that we view this solution to be explanatory:

(49) **Meaning of the *Pretérito*** (final)
$\text{PRET}\phi' = \lambda\text{Adv}[\text{PAST}(\text{Adv}[\text{ASP}_{\text{PRET}}\phi])]$, where PAST, Adv, and ASP_{PRET} are of type t/t, and:
$[[\text{PAST}\psi]]^{s,ST} = 1$ iff $\exists s' \subseteq w_s[s' <_t ST \ \& \ [s' <_t s \vee s' \leq s] \ \& \ [[\psi]]^{s',ST} = 1]$[10]
$[[\text{ASP}_{\text{PRET}}\phi]]^{s,ST} = 1$ iff ϕ-minimal(s') &
$\forall s''[s'' = s' \ \& \ \phi\text{-minimal}(s'') \rightarrow$
$\forall s''_1[s''_1 \leq_{\text{final}} s'' \rightarrow$
$\exists s_1[s_1 \leq_{\text{final}} s' \ \&$
$(s''_1 = s'_1 \vee s''_1 \leq_t s'_1)]]]$

As in (32), when the only adverbial applied to the translation and interpretations in (49) denotes the identity function, the resulting interpretation is just a stepped-function version of that given in (48).

[10]Note that this definition corresponds with the definition of *PAST*ψ in the truth conditions for the *imperfecto* in (32) above.

§3.3.2 Accounting for available readings of the *pretérito*

As noted in §1, the *pretérito* may have either an atelic or a telic reading, depending on a number of other factors in the utterance in question, including the predicate itself, the count vs. mass character of one or more of its arguments, and certain types of adverbials. With respect to argument type, we saw in examples (12) and (13) one instance of the sort of difference discussed in §2 using examples (26) and (27):

(12) Corrió petróleo por las cañerías.
flow-3sg.PRET oil through the pipes
'Oil flowed through the pipes.' (atelic)

(13) Corrieron 3000 litros de petróleo por las cañerías.
flow-3plu.PRET 3000 liters of oil through the pipes
'3000 liters of oil flowed through the pipes.' (telic)

(26) María tomó cerveza.
María drink.PRET beer
'María drank beer.'

(27) María tomó una cerveza.
María drink.PRET a beer
'María drank a beer.'

In (12), as in (26), drinking a certain portion of the substance denoted by the mass NP, here *petróleo*, entails a number of sub-eventualities of drinking parts of that portion of substance. In (13), as in (27), the count noun suggests an eventuality in which the entire measure of the substance, here *3000 litros de petróleo*, has flowed through the pipes; no sub-eventuality would involve the entire 3000 liters, so the proposition would be atelic. As noted earlier, it is possible to contextually force an atelic reading in such cases, at least for (13) and its ilk, where it's possible to imagine the flowing as a continuous, circular process. However, the telic seems to be the default, though, as argued in §2, this is only due to conversational implicature.

Now consider the use of the adverbials in (15c) and (15d), repeated here:

(15) c. Frida ensayó el libreto por una hora.
Frida rehearse.PRET the libretto for an hour
'Frida rehearsed the libretto for an hour.' (atelic: iterative or progressive)

d. Frida ensayó el libreto en una hora.
Frida rehearse.PRET the libretto in an hour
'Frida rehearsed the libretto in an hour.' (telic)

When an atelic predicate such as *por una hora* 'for an hour' in (15c) combines internally with the *pretérito*, then the resulting interpretation must be atelic, by virtue of the fact that that adverbial itself requires distributivity of the proposition within its scope (see Dowty 1979 for truth conditions of the corresponding English *for an hour*). The truth conditions given in (49) are compatible with the definition of atelicity in (23), so long as the endpoint requirement is satisfied. When a telic predicate or a sentence with a telic adverbial like *en una hora* 'in an hour' in (15d) combines internally with the *pretérito*, the resulting aktionsart is telic. Nothing in the meaning of the *pretérito* forces an atelic reading, and the telicity of the predicate or adverbial (again, see Dowty 1979 on *in an hour*) would be incompatible with an atelic interpretation.

Similarly, the adverbial *a la tienda* with the *pretérito* in (17) suggests a goal which, once reached, defines a telic eventuality, leading to the default telic interpretation of (17). This contrasts with the *imperfecto* in (18), which can only have an atelic interpretation, and hence the habitual or progressive:

(17) Juana corrió a la tienda.
Juana run.PRET to the store
'Juana ran to the store.' (telic)

(18) Juana corría a la tienda.
Juana run.IMPF to the store
'Juana ran/was running to the store.' (atelic: habitual or progressive)

Again, we predict that an atelic reading of (17) is possible, but it seems to be strongly overridden here by the possibility of unequivocally atelic *imperfecto* (or the progressive). The only atelic reading possible for (17) is the habitual, e.g. with an adverbial like *todos los dias*; the progressive is not a possible reading.

We take it that the endpoint requirement in (48–49) is the source of the notion that the *pretérito* is aspectually terminative. The claim that it is definite, in the sense defined earlier, will be true only when the *pretérito* has a telic interpretation. When it is interpreted atelically, then a progressive-like reading is possible, one which does not denote an eventuality which is intuitively "entire", but only a subpart of the eventuality-type typically associated with the predicate.

We also noted that traditionally some authors have spoken of the *pretérito* as punctual in character when compared to the durative *imperfecto*. There is now a substantial literature on the use of the Reichenbachian notion of Reference Time in interpreting tense in natural language, and especially on how the aspect of an utterance both plays a role in the way in which the current Reference Time constrains its interpretation and also contributes to the determination of the Reference Time for subsequent utterances (see especially the work by Hinrichs 1981, 1986; Kamp 1981; Kamp & Rohrer 1983; and Partee 1984). Basically, these researchers claim that in discourse, eventualities correlated with atelic propositions (call these *atelic eventualities*, for short), such as those denoted by utterances with the Spanish *imperfecto*, are asserted to be temporally inclusive of the current Reference Time. Further, atelics do not establish a new Reference Time but simply pass along the current Reference Time at the time of their utterance; since a telic eventuality is taken to more or less immediately follow its Reference Time, atelics are often taken to also be temporally inclusive of a subsequently mentioned telic eventuality. On the other hand, telic eventualities are taken to follow the current Reference Time, and in turn to establish a new Reference Time for the following discourse. In short, telics tend to move the narrative forward; hence they act as indivisible eventualities. Atelics, on the other hand, do not move Reference Time forward but instead are taken to include any telic eventualities under discussion; they hence display duration. Kamp (1981) argues that this difference in the Reference Time functions for French correlates with the use of the *passé simple* versus the *imparfait*, and that this accounts for the often cited punctuality of French *passé simple* versus the durativity of the *imparfait*. However, at least in Spanish (and we suspect in French, as well), we would argue that the correct distinction as to whether or not a new reference time is established should be atelic versus telic, rather than *passé simple* (*pretérito* in Spanish) versus *imparfait* (Spanish *imperfecto*).[19] Consider the following example:

[19] Kamp (1981) ignores the issue of aktionsart in his analysis of French, as do Kamp & Rohrer (1983). Hinrichs (1981,1986), Partee (1984), and Dowty (1986) all argue convincingly that the differentiating factor for Reference Times in English is aktionsart.

(50) a. Los guerreros se enfrentaron.
the warriors RECPR-3PL confront.PRET

b. Corrió mucha sangre.
run.PRET much blood

c. Los victoriosos quemaron la fortaleza.
the victorious burn.PRET the fortress

d. Fue una tragedia.
be.PRET a tragedy

'The warriors confronted each other. A lot of blood ran. The victors burned the fortress. It was a tragedy.'

All the verbs in this paragraph are in the *pretérito* but only sentences (a) and (c) advance the narrative, i.e. establish a new Reference Time. (a) and (c) are telic while (b) and (d) are atelic, reflecting the fact that the *pretérito* is compatible with both telicity and atelicity. But only those propositions which are telic may establish a new Reference Time, and it is precisely those cases in which the *pretérito* is interpreted as punctual. Therefore, the punctuality of the *pretérito* does not come about every time this form is used, but only when the resulting utterance receives a telic interpretation. Hence, aktionsart is finally the key to the full range of aspectual characteristics of the Spanish *pretérito* and *imperfecto*, and the behavior of the *pretérito* in contexts such as (50) is predicted by our truth conditions and the definitions of telicity and atelicity in §2.

§4 Conclusion

We have argued that aktionsart and aspect are independent categories. Though Spanish has two aspectual variants in the past tense, the *pretérito* and the *imperfecto*, these do not display a one to one correlation with the two main types of aktionsart. Rather, both atelic and telic aktionsart may be displayed by the *pretérito*, though the *imperfecto* displays only atelic aktionsart.

We laid the foundations of a truth conditional account of these forms within the framework of situation semantics, showing how Dowty's earlier characterizations of the aktionsarten could be realized in this framework while retaining Kratzer's requirement of persistence. Given these assumptions, and Portner's notion of the *minimality* of a situation relative to a proposition, we provided relatively simple truth conditions for the Spanish past tense forms. In contrast to traditional claims that the *imperfecto* is ambiguous, with as many as four meanings (the progressive, habitual, intentional, and iterative), we claim that it is unambiguous and that the subinterval property of the *imperfecto* (with varying contextual restrictions), along with variants on the modal accessibility built into the truth conditions, accounts for all the uses usually ascribed to it. In particular, what we have called the "intention in the past" reading of the *imperfecto* gets a principled explanation which was absent from traditional accounts in the Spanish literature. Whether the resulting interpretation of the *imperfecto* involves ambiguity or not seems to us to be a terminological matter: if we take the two types of modal accessibility which are permissible with the *imperfecto* to define two distinct senses, then the form is ambiguous, but it is also clear that the two senses are essentially the same in another sense, with the accessibility relation chosen a relatively minor variation. We also offered truth conditions for the *pretérito* which capture the fact that it is compatible with atelic, as well as telic readings. Finally, the truth conditions plus an understanding of

how aktionsarten influence Reference Time in discourse permitted us to elucidate the source of several traditional aspectual characterizations of the *imperfecto* and *pretérito*.

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Remarks on Simple Subjunctives*

Andreas Kathol

0 Introduction

One of the prevalent themes in the semantic literature of the last 15 years has been the idea that many natural language semantic phenomena involve what have come to be known as "tripartite structures". While this was probably most apparent in the domain of adverbial (cf. Lewis 1975) or nominal quantification (cf. Barwise and Cooper 1981), the idea of partitioning the semantic parts of a sentence into operator, restrictor, and nuclear scope (cf. Partee 1991 for a survey) has also been used in a number of other semantic domains, including modals and conditional sentences. On this view, first conceptualized in Kratzer 1978, a conditional sentence can be seen as a special kind of modal sentence where the *if*-clause contributes the domain restriction for a quantification over possible worlds. The quantificational operator relating the restricted domain and the assertion is either given by a modal in the main clause, or implicitly assumed to be that of a universal if no modal is present. This general approach can cover both indicative conditionals as well as counterfactual—or as we will call them in this study, subjunctive—conditionals, in which the main clause predicate is in the form of *would* + infinitive in English or a subjunctive form in German, and the *if*-clause in an analogous nonindicative form. Often, it is assumed, cf. Heim 1992:218, that (part of) the choice of indicative vs. subjunctive conditionals is governed by conditions of *use*, rather than truth conditions per se.

However, while quite a considerable amount of effort has been spent on characterizing the semantics of subjunctive conditional sentences with overt antecedents (*if*-clauses), relatively little attention has been paid to the particular kinds of problems raised by those instances where we find a clause in subjunctive mood without an overt antecedent present. Given the tripartite perspective, this raises the issue of what fills the role of restrictor and by what mechanism it gets there. The corresponding questions regarding nonovert (modal) operators hardly seem to present much of a problem, as the default assumption of a necessity operator straightforwardly presents an answer.[1] Because of this, it may have been thought that the problem of recovering the content of

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[1] Cf. Portner 1993:34: "The default conversational force is necessity."

nonovert restrictors is equally simple, but as was shown in a number of studies by Walter Kasper (1987, 1992), this is not so. We will take his observations as a starting point for our own investigation into the problem.

1 Kasper's account of Simple Subjunctives

Kasper 1992, which is based in large part on Kasper 1987, points out that while often, the antecedent of a subjunctive conditional can be recovered from context, as in (1) (Kasper 1992:308), there are also uses of simple subjunctives where the antecedent does not seem to be recovered from the context, but rather from the content of the subjunctive clause itself.

(1) Q: What would John do **if his wife left him?**
A: He would marry his girlfriend.

Thus, in the following example, Kasper claims that the antecedent of the conditional is recoverable from the "preconditions" of the predicate in the main clause, *fail the exam*, resulting in a reconstructed content along the lines given in (2b): (cf. Kasper:309)

(2) a. Your brother Peter wouldn't have failed the exam.
b. **If your brother Peter had taken the exam (in your place),**
[he] wouldn't have failed [it].

This meaning arises for instance in a context where Peter's mother utters her disappointment toward her son John, who recently failed said exam. What this sentence conveys is the belief that Peter taking the exam in the place of John would have been more successful. As Kasper points out, in such a situation, it is not possible to reconstruct the utterance in (2a) as meaning something like:

(3) **If your brother Peter had had enough sleep,**
[he] wouldn't have failed the exam.

One important difference between the sentences in (2b) and (3) is that in (3), there seems to be a presupposition that Peter in fact failed the exam, whereas if anything, the opposite is the case for (2b). Moreover, this appears to contradict the commonly held assumption that the use of the subjunctive presupposes falsehood of the indicative counterpart for both antecedent and consequent. Thus, while in (3), there does seem to be an understanding that Peter indeed did not have enough sleep and that he did fail the exam, it is not clear in what way the indicative counterparts of (2a) or of the consequent of (2b) could be considered false. Instead, it appears that nonparticipation in an exam renders a claim of nonfailure "trivially true."

This situation reverses itself if we look at the counterparts of (2) and (3) that contain the nonnegated versions of the respective consequents:[2]

(4) a. Your brother Peter would have failed the exam.
b. **If your brother Peter had taken the exam (in your place),**
[he] would have failed [it].

(5) **If your brother Peter had had less sleep,**
[he] would have failed the exam.

[2] To enhance plausibility, the antecedent in (5) has been changed slightly too.

Here, it appears that the subjunctive indeed carries the presuppositions that one would usually expect. Thus, Kasper suggests that in (5), as before, the falsehood of the indicative counterpart is presupposed, i.e. that Peter did not fail the exam. But notice that the same inference is now also possible for (4), viz. that Peter did not fail the exam.

Kasper's conclusions from the facts in (2-4) are twofold:

1. Subjunctives can be licensed not only by outright falsity of the indicative counterpart, but also by means of "preconditions" on the indicative counterpart which are not met.
2. While nonnegated simple indicatives carry such preconditions, this is not the case for negated simple indicatives.

Thus, according to Kasper, if Peter never took the exam, a negated sentence like the following can nevertheless be felicitously and truthfully uttered:

(6) Peter did not fail the exam.

As a consequence of the statements in 1. and 2. above, the asymmetric inference patterns for (2) and (4) fall out: (cf. Kasper:312)

> *The corresponding simple subjunctive then presupposes the falsity of the simple indicative just because the simple subjunctive presupposes the falsity of those necessary preconditions. In the case of negated simple subjunctives, on the other hand, the fact that the preconditions are not satisfied is compatible with the truth of the corresponding simple indicative.*

One important issue we need to turn to next is the nature of the preconditions which Kasper assumes to be responsible for licensing subjunctives in those cases where they are not satisfied. He does acknowledge that there appears to be a striking similarity between this notion of precondition and that of "presupposition". Thus, for instance, in the example in (7a), the definite description gives rise to an existence presupposition, and it is precisely the nonfulfillment of this presupposition that can license (one reading of) the sentence in (7b), given in (7c): (cf. Kasper:314)

(7) a. The king of France is (not) bald.
b. The king of France would (not) be bald.
c. **If there were a king of France,** [he] would (not) be bald.

However, Kasper stops short of equating his notion of precondition with that of presupposition. It is not exactly clear that he has any convincing argument for doing so. Rather, it seems that Kasper wants to maintain the distinction mostly on conceptual grounds. Thus, he assumes presuppositions to be associated with the *linguistic* expression of an utterance, rather than its propositional meaning, which means, for instance that participating in an exam is viewed as a *precondition* for failing it, but not as a *presupposition* as it is not particularly tied to the linguistic expression *fail an exam*.

At this point, we may wonder whether this division is really grounded in empirical fact or rather has to do with an antiquated conception of presupposition as something that is intimately linked with a linguistic form.[3] For instance, it has been known since at least Karttunen 1973 that conditional sentences act as filters for the purposes of presupposition projection. That is, whether a presupposition of the consequent is projected to the whole sentence depends on the antecedent and its entailments. For example in (8), the

[3] Note, for instance, that any mention of treatments of presuppositions in terms of context change and the resulting theory of presupposition projection, as in Heim (1982, 1983, 1992) is conspicuously absent from the references.

consequent contains a possessive pronoun which will give rise to the presupposition that there are indeed instances of the common noun (i.e. children) that "belong to" the possessor. Since under normal circumstances, being married bears no necessary impact on someone's parental status, the presupposition that Keith has children is projected to the whole sentence (cf. Chierchia and McConnell-Ginet 1990).

(8) If Keith is married to Linda, all of his children are asleep.

The situation is rather different, however, if the antecedent entails any of the presuppositions of the consequent. It has been said that in this case, the presuppositions are "filtered out". A more adequate way of looking at it may be that the antecedent provides a local (as opposed to global) context which already satisfies the presuppositions of the consequent. This can be seen in (9), where the whole sentence no longer carries a presupposition that Keith is the father to any children.

(9) If Keith has children, all of his children are asleep.

What is important is that Kasper's preconditions seem to behave in exactly the same way for the purposes of "precondition" projection. Thus, in (10), where the antecedent has no bearing on the preconditions of the consequent, the inference that Peter indeed participated in the exam survives:

(10) If Peter didn't study much, he (probably) failed the exam.

In contrast, if the antecedent (or its entailments) locally satisfies the preconditions, the sentence as a whole no longer allows the inference that Peter actually participated in the exam:

(11) If Peter took the exam, he (probably) failed it.

If the notion of presupposition as a kind of additional constraint on meaning tied to linguistic form, and Kasper's preconditions indeed were distinct (albeit partially overlapping) phenomena, this convergence would be coincidental. For all we know, the projection behavior of these preconditions could be rather different from that of "first-class" presuppositions. On the other hand, a rather different picture emerges if one views presuppositions in terms of the requirements they impose on *context*. On such a view, advanced by Stalnaker and first explicitly articulated formally in Heim 1983, a presupposition of a sentence is an entailment that is shared among all contexts admitting that sentence. What triggers such requirements on context is pretty much of secondary interest. While it often seems to originate with linguistic form, as, say, for definite descriptions, one can think of Kasper's preconditions in terms of requirements that are imposed on context by virtue of how the world is viewed to work; i.e. that failing an exam necessitates taking it etc. What is important for the purposes of explaining the licensing of subjunctives, then, are the requirements on context, or more precisely, that some among them not be fulfilled,[4] regardless of whether these requirements are "presuppositional" in Kasper's narrow use of the term. In our own usage of the term presupposition, we will from now on think of it in terms of entailments of contexts admitting a given sentence, following Heim 1983, 1992. Along with the terminology, we also adopt the view that strictly speaking, there is no such thing as "presupposition cancellation." Instead, it can be reasonably argued that cases such as (6) that give the *appearance* of presupposition cancellation should be reanalyzed in terms of a different role played by the negation here. Specifically, once one considers contexts in which such sentences can be felicitously uttered, it becomes clear that they normally exhibit an

[4] Or, given the epistemic state of the speaker, that it is deemed *unlikely* that the state of affairs in question holds, cf. Portner 1993:28.

element of corrective response which is typical of "metalinguistic" negation, cf. Horn 1985:

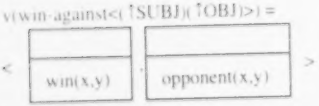
(6') Q: Did Peter fail the exam?
A: Peter did not fail the exam. In fact, he never took it!

As Horn has shown, the function of metalinguistic negation is to deny the appropriateness of a particular utterance based on such diverse aspects as presuppositions or even pronunciation. Hence, in (6'), the answer can similarly be understood as calling into question whether the predicate *fail the exam* can even felicitously be applied in Peter's case as opposed to truthconditionally negating the proposition 'Peter failed the exam'. If the latter were the case, it would be a mystery why the sentence in A is in fact compatible with the truth of 'Peter did not pass the exam'.

The absence of an explicit recognition of the role of context for the notion of presupposition and the projection problem carries over to the particular proposals Kasper makes to account for simple subjunctives formally in a Discourse Representation Theory (DRT) framework (cf. Kamp 1981) based on a Lexical Functional Grammar (LFG) syntactic backbone. This is somewhat ironic, as DRT was initially developed as a dynamic theory, that is, as one that was supposed to extend the limits of the purely sentence-based view of classical Montague Semantics and take into account the influence of discourse for instance on possible anaphoric relations. Yet, at least as far as Kasper's usage of DRT goes, one finds little evidence that his dynamic perspective is thought to encompass contextual influence beyond pronominal reference—contrary to the spirit of Heim's Context Change Semantics, which is often referred to as a "twin" of DRT.

In particular, Kasper proposes to bring presuppositional effects into DRT by letting the semantic representation of a linguistic expression correspond to a pair of discourse representation structures (DRSs). The first, *textual* DRS represents the truthconditional content, and the second, *background*, DRS encodes conditions which may affect the interpretation of the first DRS. For the most part, what a linguistic expression contributes in terms of textual and background DRSs will be pretty much alike. However, for instance in the case of a verb such as *win-against*, the background DRS will contain a condition to the effect that in order to win against someone, one has to be the latter's opponent (Kasper:325).[5]

(12) $\forall$(win-against<(↑SUBJ)(↑OBJ)>) =

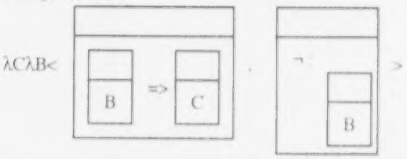


Crucially now, the bipartite DRS Kasper proposes for the subjunctive operator is sensitive to the distinction between textual and background DRSs. Thus in (13), the λ-expressions[6] specify that the first part of a DRS that this operator combines with, that is the variable over conditions, *C*, fill the slot of the textual DRS in the resulting represention, while the second argument, *B*, picks up the information in the background DRS and inserts it in all occurrences of this variable (Kasper:325).

[5] While Kasper is not explicit on this point, one has to assume that some general principle ensures that the semantic roles of the predicates *win* and *opponent* are linked to the appropriate grammatical functions, SUBJ and OBJ.

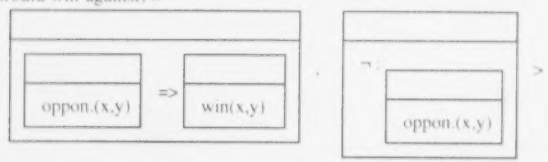
[6] The treatment of DRSs as functional objects, i.e. as functions from (pairs of) DRSs to (pairs of) DRSs allows semantic construction to be reduced to functional application.

(13) v(subjunctive) =



As a result, the nonnegated conditions serve as the antecedent for the conditional constraint that represents the textual part of the new DRS. At the same time, the resulting DRS will now have the negated background conditions of its argument as its own background conditions. Once the textual DRS has been built up for a sentence, the background DRS is then added to it by a process of *compatibility restricted incrementation* (cf. Gazdar's 1979:131 notion of *satisfiable incrementation*). This means that given a textual DRS K and a background DRS BG, only those conditions of BG are added to the resulting textual representation that are compatible with the other conditions of BG as well as all those of K. In the case of subjunctives, this amounts by default to adding the entire negated DRS in the background BG in (13). As a consequence, all previous and following conditions must be compatible with these conditions, which has the effect of rendering the antecedent of the conditional counterfactual.[7] The result of combining the lexical constribution of *win-against* with that of the subjunctive, yielding *would win-against*, is given in (14), which could be paraphased as something like "x would win against y iff x wins against y provided x and y are opponents of each other, and it is part of the background information that x and y are not opponents of each other."

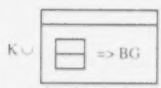
(14) v(would win-against) =



On closer inspection, there are a number of aspects of Kasper's approach that are questionable. Consider the particular kinds of backgrounds comprising the preconditions whose failure gives rise to a licensing of subjunctives. The one example given, namely that the verb *win-against* has a precondition to the effect that those involved in a winning event be opponents of each other, is fairly illustrative of what is wrong with this kind of approach. Imagine a situation in which Peter is matched against Boris Becker ("BB") in a tennis tournament, but for some reason, the two never get to play against each other (for

[7] As Kasper himself notes (p. 330) as far as the treatment of simple subjunctives is concerned, it appears that instead of his compatibility restricted incrementation, simple union of the textual DRS K and the background DRS BG, the latter given as the consequent of a conditional with empty antecedent, would suffice, given in (i):

(i)



The reason for this is that there will never be a conflict among conditions as the textual part of a subjunctive sentence is given as a complex, conditional DRS, which means that none of the conditions are asserted, only the *conditional relationship* between the two DRSs notated as "=>".

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instance, because Peter broke his wrist when he fell off the curb at his hotel). It seems plausible to regard Peter and BB indeed as opponents of each other. Kasper's theory would predict that the following sentence should not be an acceptable simple subjunctive as the preconditions *are* met by context. However, this example seems perfectly fine if it is understood that some other participant played a full match against BB and lost.

(15) Peter would have won against Boris Becker.

From this, we may conclude that the preconditions for winning have to be incremented by a condition encoding the requirement that the people involved actually *played* against each other. But that won't help much either, for suppose that Peter and BB actually get to meet on the tennis court, but the match is never finished because of an injury afflicting Peter half-way during the match. In this situation again, a sentence like (15) would be predicted to be impossible, even in a scenario as stated above where others actually played and lost against BB.

The point made by these examples is that there is no principled way to anticipate all the preconditions of an action that may become relevant for constructing ways in which the event in question is prevented from taking place in reality. The problem is reminiscent of the approach to word meaning in terms of lexical decomposition into necessary and sufficient conditions. All such efforts are notoriously fraught with the problem that often there is an inherent vagueness in the interpretation of such conditions and that because of the great deal of situational dependency of what are perceived to be defining features, the whole enterprise is open-ended in principle.[5] At the same time, it is quite clear from Kasper's description that he considers such background information part of what is specified as the lexical information associated with verbs such as *win*.

Another argument against Kasper's explicit encoding of failed preconditions in DRSs comes from cross-linguistic considerations. Let us suppose that eligible preconditions for licensing subjunctives cannot directly be deduced from the meaning of a given verb, but have to be made explicit as the background part of the lexically contributed DRS for a given verb. Then it should, at least in principle, be possible for two languages to converge on the semantic contribution of the subjunctive as well as the textual meaning of a given verb, but disagree on whether or not a certain situation licenses the use of the subjunctive. The reason for this is that there is no guarantee that each language will also encode identical preconditions for the verb in questions. And of course, with different preconditions, the resulting DRSs will be different as well, specifying different satisfaction conditions. While this is somewhat hard to test empirically (because it isn't always immediately obvious that the first variable in this equation, i.e. the meaning contribution of the subjunctive, is really identical), it seems to be an implausible scenario, and certainly is not supported by the situation with regard to English and German. For instance, the equivalent of (2a), given as (16) below, is virtually synonymous with the English sentence.

(16) Dein Bruder Peter wäre in der Prüfung nicht durchgefallen.
your brother Peter would.have in the exam not failed

This would be a coincidental fact in Kasper's theory, but would necessarily fall out in any account in which the ingredients for the semantics consists of no more than the lexical meaning of the words involved, the felicity conditions imposed on context by subjunctives, and very general, cross-linguistically valid considerations of how domain restriction works in these cases.

[5] This is also reminiscent of what Kratzer 1989 has to say about one attempt at stating the truth conditions of counterfactuals. "Pilosophers like Nelos Goodman [...] actually took it upon themselves to try to say exactly what the facts are which have to be taken into account in the evaluation of a counterfactual sentence. [...] Goodman eventually reached the conclusion that the additional premises [needed to make the consequent follow logically, AK] don't seem to be specifiable in a non-circular way."

2 The role of intonation and informational structure

Another of the more severe shortcomings of the analysis offered by Kasper is the fact that he does not establish a connection between the special intonational/information-structural properties of the kind of sentences he considers and their meaning. Thus, Kasper notes (p. 313) that sentences containing simple subjunctives are "often used with contrastive stress." What is probably meant by this is that in the sentence in (17a), the subject Peter carries the intonational properties of a contrastive topic, which the paraphrase in (17b) tries to elucidate.

(17) a. *Peter* L*H L (H%) would have H*L passed that exam.
b. As for Peter (as opposed to someone else who didn't pass the exam), he would have passed the exam

As is noted by Partee 1991:178, the function of contrastive topics is to "present one topic among alternative possible topics". Intonationally, such topics are often realized in terms of what Jackendoff 1972, following Bolinger 1965, refers to as a "B accent", that is, a rising nuclear tone L*H consisting of a low tone (L*) associated with the stressed syllable and a trailing high tone (H) to the following one (cf. Féry 1992:21). Since B accents usually constitute their own intermediate phrases, one also finds a low phrase accent (L) at the end.[9] Moreover, it seems that especially in slower speech, B-accented constituents can form an Intonation phrase (IP) of their own, in which case there is a high boundary tone (H%). If we compare the example in (17) with the version in which *Peter* does not bear a B accent, a noticeable difference in interpretation emerges:

(18) Peter would have H*L passed that exam.

Unless the context has already established that someone other than Peter failed that exam and the attention is now shifted to how Peter would have fared in comparison (for instance by means of a question like "How about Peter?"), it is essentially impossible to get a contrastive interpretation here. Instead, we assume that Peter did not pass his own exam in actuality and that under some contextually salient circumstance (such as his having had more sleep the night before, cf. (3) above), his fate would have been otherwise.

As the counterpart of the B accent, we have what Jackendoff calls the "A accent", whose intonational implementation is in terms of a falling H*L contour. If a sentence contains a B accent, there will also have to be an A accent, but the reverse does not hold, as is exemplified by the sole A-accent in (18). Kasper notes that constituents other than subjects can also bear contrastive stress, such as the direct object *that exam* in (19a):

(19) a. Peter would have passed *that exam*.
b. As for that exam (as opposed to another exam which he didn't pass), Peter would have passed it.

Frequently, B-accented nonsubjects are realized as syntactic topics, as in (20):

(20) *That exam*, Peter would have passed.

[9] But see Féry 1992 for arguments that intermediate phrases in German do not have a phrase accent.

Incidentally, German appears to be somewhat more tolerant in the extent that it allows constituents in positions other than syntactic topic to be construed as contrastive topics.[10] Thus, in (24) a contrastive topic is fairly happy to occur in the *Mittelfeld*.[11] [12]

(21) Peter hätte *dieses Examen* bestanden.
Peter had-SUBJ this exam passed.
'This exam, Peter would have passed.'

The reason why intonational/information-structural properties are important for the understanding of subjunctives is that an adequate account should in some way be able to elucidate why certain figurations are tied so closely with constraints on interpretation. That is, if in the absence of a B accent, the range of antecedents that can be accomodated is somewhat limited, cf. (18) above, what is it that the B accent adds so as to allow the contrastive interpretation?

4 Von Fintel 1994

One recent attempt to tie information-structural considerations into the characterization of the meaning of such sentences is made in von Fintel 1994. Drawing on Rooth's 1992 anaphoric theory of focus, von Fintel assumes that a sentence such as (17a) contains a number of elements, adjoined to the syntactic tree at particular places, which establish anaphoric links to operator domains within the same sentence or prior discourse. In particular, he adopts Rooth's "~" operator, by which an inaudible "focus anaphor" is attached to a syntactic constituent containing a focus. As a result, the domain for the focus is then established by virtue of the fact that this focus anaphor has to find an antecedent (within the same sentence or in prior discourse), that is, determine a domain with particular properties determined by the meaning of the focused element.[13] Von Fintel also proposes another operator, "≈", which attaches to a topic constituent and whose role it is to establish an anaphoric link to other possible predications over the topic (more precisely, a set of propositions in which something else is predicated over the topic). As the logical form for sentences of the type in (17a), von Fintel then proposes the following (p. 62):

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[10] As long as the topic precedes the constituent bearing the matching A accent, cf.

(i) ??Peter bestünde *dieses Examen*
A B
Peter würde *dieses Examen* bestehen
B A

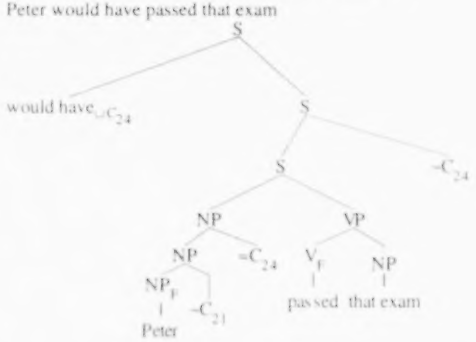
[11] This is the commonly used name for the syntactic material between the clause-initial position of finite verbs or complementizers and and the clause-final verb cluster in German clauses.

[12] Cf. Engdahl and Vallduví 1994: 50 for similar observations regarding the flexibility in the implemention of informational structuring in Dutch.

[13] Cf. Fintel: 38, where φ is a syntactic constituent, Γ a focus anaphor, and $[\![\ ]\!]^o$ denotes the "ordinary" semantic value of an expression and $[\![\ ]\!]^f$ its "focus semantic" value, that is the set of all possible alternatives to the focussed constituent.

(i) a. $[\![\varphi \sim \Gamma\ ]\!]^o = [\![\ \varphi\ ]\!]^o$ (no effect on assertion)
b. $[\![\varphi \sim \Gamma\ ]\!]^f = \{[\![\ \varphi\ ]\!]^o\}$ (closing off focus)
c. Presuppositions: 1. $[\![\Gamma\ ]\!]^o \subseteq [\![\ \varphi\ ]\!]^f$
2. $[\![\ \varphi\ ]\!]^o \in [\![\Gamma\ ]\!]^o$
3. $\exists \xi, \zeta \in [\![\Gamma\ ]\!] \& \xi \neq [\![\ \varphi\ ]\!]$

(22) Peter would have passed that exam



Here, the subscript $\cup C_{24}$ on the quantificational operator, *would have*, states the restrictor part of the tripartite structure, whose modal force is given as *would have* and whose nuclear scope is the entire sentence without the modal. As the modal operator's first argument, $\cup C_{24}$ denotes the set union of all the propositions picked out by the anaphor C_{24}, yielding the *resource domain* for the operator in terms of a set of situations. C_{24} in turn is constrained by the presuppositions associated with its status as a topic anaphor correlated with the subject, *Peter*, and focus anaphor associated with the focused main verb *passed*. More specifically, the denotation of C_{24} will be a subset of the set of propositions of the form 'Peter φs that exam.' According to Rooth's Alternative Semantics, this follows from the fact that the sentence contains a focused verb, *passed*, which contributes a variable meaning to the focus-semantic interpretation of the constituent that C_{24} syntactically adjoins to. As a result of the variable, the focus-semantic value will not be a single proposition, but instead the set of propositions obtained by instantiating the variable with (alternative) values. The ordinary semantic value of C_{24} in turn is given as a subset of that set, as not all possible instantiations are admitted by the context. Accordingly, the set of situations that serves as the first argument of the modal operator, *would have*, will comprise a subset of those in which Peter φs that exam, where von Fintel takes φ to range over *pass/not pass*. Moreover, note that *Peter* also bears a focus, which via the focus anaphor C_{21} evokes a set of contextually salient alternatives to Peter. Von Fintel suggests that we can plausibly assume this to be a set of people. However, C_{21} does not bear any focus-semantic import beyond the subject because once it combines with the NP, the focus-semantic value of the the resulting constituent will be closed off and prevented from percolating higher in the tree. Moreover, C_{21} does not occur elsewhere in the clause, say as the restrictor of an operator. On the other hand, C_{24} is also present in the subject NP as a topic anaphor (indicated by "∞").[14] This establishes an anaphoric link to a set of propositions in which something is predicated of the topic-marked constituent.

Thus, a paraphrase of von Fintel's logical form would be something like: "Given that we are talking about people, all hypothetical situations in which Peter passes or doesn't pass that exam are such that they can be extended to situations in which Peter passes that exam." Von Fintel assumes that the hypothetical part comes about via the presupposition

[14] Cf. the interpretation of the topic marking, given in Fintel 53:

(i) a. $[\![\varphi_{\sim\Gamma}]\!]^o = [\![\varphi]\!]^o$ (no effect on assertion)

b. $[\![\varphi_{\sim\Gamma}]\!]^f = [\![\varphi]\!]^f$ (no affect on focus)

c. Presuppositions: $[\![\Gamma]\!]^o \subseteq \{p : \exists \pi . p = [\![\varphi]\!]^f(\pi)\}$

with π of the lowest type such that $[\![\varphi]\!]^o(\pi)$ or $\pi([\![\varphi]\!]^o)$ is of type t.

associated with *would* that the situations considered, i.e. those in the resource domain, have to be counterfactual. Since the domain of quantification consists of counterfactual passing as well as not-passing situations, the net effect is that in the actual world, Peter must neither have passed nor failed to pass the exam, which, according to von Fintel, requires that Peter did not even take the exam, i.e. that some of the preconditions for taking an exam are not given.

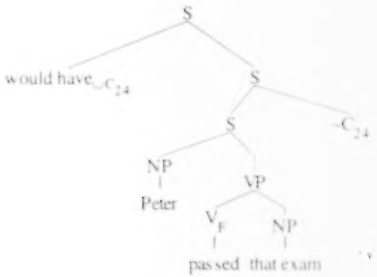
While von Fintel's account is superior over Kasper's regarding virtually all of the shortcomings found earlier with the latter work, there are a number of deficiencies with this theory as well. The first is noticed by von Fintel himself (p. 54), as he points out that there is no guarantee that the set of propositions that a topic is required to be anaphoric to actually requires that the topic be a "constituent" of those propositions. Since there are in effect no requirements on the kinds of properties that are predicated of the topic in the discourse topic, there is nothing that rules out taking properties that map the topic into any arbitrary proposition.

Further, note that while von Fintel's approach is an attempt to get away from rather "algorithmic", syntactic theories of how domains are retrieved from linguistic form (cf. e.g. Diesing 1990) towards a more pragmatically-based one, it is not entirely clear what in his system ensures that focus anaphors such as his C_{24} in (22) are actually taken to identify the domain of the operator *would have*. Thus, there is no mechanism, syntactic or pragmatic, which would prevent this anaphor, and hence the informational structuring of the sentence, from being ignored by the operator.[15]

Another shortcoming is somewhat more subtle and pertains to the role of the contrastive topic in von Fintel's logical form in (22) for simple subjunctive sentences. It appears that the occurrence of C_{24} as a topic anaphor has no bearing in determining the resource domain for the modal operator, *would have*. To see this, recall that the role of a topic anaphor is to link the sentence to a discourse topic containing a set of predications over the topic. Thus, in (22), the value of C_{24}'s occurrence as a topic anaphor is a subset of those propositions in which Peter does something. On the other hand, the occurrence of C_{24} as a focus anaphor, adjoined to S, presupposes a salient set of propositions of the form 'Peter φs that exam,' which is a stronger condition than, and hence supersedes, the presuppositional effect originating with the topic anaphor. If this is so, however, then the set of propositions that contribute the resource domain for the modal operator will be entirely determined by the focused verb, *passed*, and the focus anaphor C_{24}. Note also, that the lowest focus anaphor, C_{21} only requires there to be a set of salient persons, but this set and the properties of these people have no bearing on the determination of the value for C_{24}. What this means, though, is that the meaning of the sentence will, in its relevant aspects (i.e. the determination of the operator domain), come out to be precisely the same if the sentence does not contain a contrastive topic marking on the subject as in our example in (17) above. Its representation within von Fintel's framework is given in (23):

[15] Similarly, there seems to be nothing that forces the topic anaphor and the higher focus anaphor to be identified as the same, C_{24}. If they were indeed different, there is no guarantee that their respective antecedent sets bear any relation to each other.

(23)



This presents two problems for von Fintel's account. First, it makes the empirically wrong prediction that the particular kinds of interpretation found with simple subjunctives should also be possible if the sentence contains no prosodically marked contrastive topic. And second, even if it were possible to get this kind of interpretation without such a topic, it remains a mystery what this kind of informational structuring adds to the interpretation of simple subjunctives of the type being considered here.

5 Information Structure and Domain Restriction

There is one very important respect in which von Fintel's account is qualitatively different from the approach pursued by Kasper. This is the idea that for an expression containing an operator, the domain of that operator cannot be determined by confining one's consideration to that expression. Rather, a full account is only possible if one takes the pragmatic properties of the elements involved into account. Specifically, there is an intimate relationship between domain restriction and discourse. In von Fintel's theory this relationship is established by assimilating the behavior of focus/topic to that of anaphors. A rather different perspective suggests itself in the theory of pragmatics developed in Roberts 1995, which I summarize briefly below.

One important metaphor in Roberts' theory is that of language as a *game*, which is a line of thought that goes back to Wittgenstein and has been brought to special prominence by Carlson 1983. This means that linguistic behavior, in particular the constituents of a discourse, can best be understood as the interaction of cooperative players trying to attain certain goals, chief among them to arrive at a mutually agreed upon set of beliefs about the world, i.e. to maintain a *common ground* in the sense of Stalnaker 1979. Borrowing from Carlson 1983, Roberts takes the exchanges of the game to consist of moves governed by conversational and conventional constraints (or rules). Such moves consist of set-up moves such as questions and payoff moves such as assertions that serve as answers to previously introduced (and mutually accepted) questions. In order to attain a particular goal (i.e. to obtain a certain piece of information), a discourse participant pursues a *strategy of inquiry* which is implemented by a set of increasingly specific set-up moves. Such strategies, or, more accurately, the (temporal) sequence of set-up moves carrying out the strategy, together with the corresponding payoff moves constitute what Roberts calls the *information structure* of a discourse.

Of central importance in this connection is the notion of *question under discussion* (QUD). A question under discussion—also referred to as the *topic under discussion* or the *discourse topic*—is essentially the most recent set-up move that the conversation participants have accepted and hence are committed to finding at least a partial answer

for. The semantic import of a question is to provide a set of alternatives; thus to (partially) answer a question is to exclude certain possibilities from consideration. Alternatively, instead of providing a direct answer via an assertion, an interlocutor may choose to introduce a more specific subquestion, i.e. set up a strategy of questions. Only if a move accomplishes one of these two possibilities is it deemed *relevant* to the question under discussion. Both options share the property of narrowing down the set of possibilities considered for what is taken to hold in the world. But while answers are choices among alternatives—ideally reflecting some discourse participant's state of knowledge of the world—a subquestion only brings into view the particular aspects of reality that the current conversation is meant to elucidate with the understanding that more specific choices among the set of current alternatives may still be made. Ultimately, one can regard every question as a subquestion to what Roberts calls the "Big Question", i.e. *What is the way that things are?*

Crucially, some of the constraints on interpretation of an utterance can only be understood properly if the utterance is viewed in the context of the information structure of the preceding context, specifically, the current question under discussion. Any utterance must be relevant with respect to the latter in the sense mentioned before. However, it is not required that the discourse topic has to have been introduced by an overt question; i.e., often the question under discussion is only implicit in the discourse and hence discourse participants have to accomodate a plausible topic in light of a recent utterance. Consequently, a given utterance may not be associated with a unique question under discussion.[16]

At this point, it is useful to give a simple example, along the lines of Roberts 1995, which also serves to illustrate a more formal characterization of the relevant notions. Consider the discourse in (24):

(24) a. Who ate what?
b. What did [Fred] eat?
c. [Fred] ate [the beans].

In (24c), we have an utterance with two foci, the one on the subject being marked with a B accent while the object exhibits an A accent. These two foci give rise to what Roberts 1995:18, following Rooth 1985, calls the *focus alternative set*:

(25) The **focus alternative set** corresponding to a constituent β, $\|\beta\|_f$, is the set of all interpretations obtained by replacing all the F-marked (focused) constituents in β with variables, and then interpreting the result relative to each memeber of the set of all assignment functions which vary at most in the values they assign to those variables.

Accordingly, the focus alternative set of (24c) is as given in (26):

(26) $\|(24c)\|_f = \{ p : \exists u,v \in D [p = u \text{ ate } v] \}$

That is, it is the set of propositions such that someone eats something in p.

Now, we need to make explicit how the assertion in (24c) is part of the information structure of the whole discourse. To this end, we need to take a closer look at the aspect of the meaning of questions that is of immediate pragmatic relevance. Questions such as (24a) give rise to a set of propositions that constitute *Q-alternatives*. The definition of this notion is given in (27) from Roberts 1995:13:

[16] See also Roberts and Kadmon 1986 on this point.

(27) The Q-alternatives corresponding to a clause α:
$\text{Q-alt}(\alpha) = \{p: (\exists u^{i,1}, \ldots, u^{i,n} \in D)[p = |\beta|(u^{i,1}) \ldots (u^{i,n})]\}$,
where: α has the logical form $\text{wh}_{i,1}, \ldots, \text{wh}_{i,n}(\beta)$,
with $\{\text{wh}_{i,1}, \ldots, \text{wh}_{i,n}\}$ the (possibly empty) set of *wh*-elements in α, and
D is the domain of the model for the language, suitably sortally restricted.

Here, $|\beta|$ denotes the truthconditional meaning of an expression β, i.e. a set of possible worlds, or, following Kratzer 1989, a set of situations. Basically, the Q-alternatives of a question provide all the possible propositions—cf. Hamblin 1973—from which an an answer, be it complete or partial, must be picked. Thus, we couldn't answer the question in (24a) with an utterance like *It is raining outside*. In fact, the Q-alternatives of a question α *are* the denotation of that question, as stated in (28):

(28) $|?\alpha| = \text{Q-alt}(\alpha)$

The notions of focus alternatives and Q-alternatives are also important for ensuring cohesion among questions and answers in discourse. In particular, they are crucial for defining what it is for an utterance to be **congruent** to a question:

(29) Move β is *congruent* to a question $?\alpha$ iff its focal alternatives $\|\beta\|_f$ are the Q-alternatives determined by $?\alpha$, i.e. iff $\|\beta\|_f = \text{Q-alt}(\alpha)$.

In particular, we need to make sure that an utterance is congruent not to any arbitrary question, but, more specifically, to a question under discussion which the discourse is meant to address:

(30) Presupposition of prosodic focus in an utterance $*\beta$ (assertion, question, imperative)
β is congruent to a question under discussion (in the information structure).

Thus, the Q-alternative set of (24a) is as given in (31):

(31) $\text{Q-alt}((24a)) = \{ p : \exists u,v \in D\,[p = \text{late}(u,v)] \}$

This set is precisely the same as the one in (26), hence (24c) is congruent to the question in (24a).

Furthermore, I follow Roberts in assuming that in (24), (24c) is not simply an answer to (24a). Rather, the prosodic asymmetry between the B-accented subject and the A-accented object seems to indicate that in answering (24a), a certain strategy of inquiry is involved that employs the subquestion in (24b). Logically, the question under discussion entails the subquestion because the set of all complete answers to the first includes the set of all complete answers to the second (see Roberts 1995 for discussion). The set of all complete answers to the question under discussion sets up a partition on the context set. To illustrate, let us assume that we have a model with two people, Fred and Bill, and two edible substances, beans and rice. Then one complete answer to the question in (24a) would be as follows:

(32) a. Fred ate the beans.
b. Fred did not eat the rice.
c. Bill did not eat the beans.
d. Bill ate the rice.

Any other possible combination constitutes a different complete answer. Only one combination may hold in a given world. Conversely, we can take the worlds in which one complete answer holds to constitute and equivalence class which does not intersect with the set of worlds in which any other combination of values for the eating relation holds. In this sense, the Q-alternatives of the question under discussion establish a partition on the context set. However, answers are rarely complete; thus, a rather than a full accounting of how the world is with respect to a certain question under discussion, we often have to be content with partial answers. An answer is partial if it excludes at least one equivalence class from the set of all complete answers. Thus, (32a) is a partial answer because it removes from the context set all those worlds in which Fred did not eat the beans. But this for instance still leaves Fred's status with respect to the rice unresolved. Note also that any complete answer is also partial, but not vice versa.

How does the foregoing help to shed some light on the problem at hand, i.e. the interpretation of simple subjunctives? A sentence such as the one in (17a), I claim, can only be dealt with adequately if we consider it as an answer to the question under discussion. In particular, because of the distribution of accents, we also have to assume that there is a particular strategy of inquiry that this sentence is to address.

(33) a. Who bears what relation to the exam?
b. What relation does Peter bear to the exam?
c. [Peter] [would have passed] the exam.

One important assumption is that the accent on *passed* is taken to indicate broad focus in the sense that the modal is part of the constituent replaced by variables in the determination of the focus alternative set. Consequently, this set will contain propositions in which Peter bears a "real" relation to the exam (eg., he takes it and passes/flunks) as well as those in which what I will refer to as "modal relations" hold. This means that in a given world w, it may not even make sense to wonder about Peters passing/failing of said exam because the presuppositions are not met in such a world (for instance, if he never took the exam in that world). But that still leaves open the possibility that Peter bears a modal relation to the exam, for instance, that he *might* have passed it. In other words, if we consider the worlds that are modally accessible from w, it may not be excluded that Peter passes the exam in such worlds. A relevant answer to the question in (33a,b) will then be one that excludes at least one cell in the partition set up by the Q-alternatives to (33a). As a consequence of allowing modal relations, it follows that there can never be a complete answer, in Roberts' sense, as there is an infinitude of possible modal relations which no answer can exhaustively specify. At first this seems to raise a problem. Since *any* modal relation contributes a partial answer, and hence ensures congruence in Roberts' sense, why could the *would*-counterfactual not be interpreted with any implicit antecedent? That is, if the requirement of congruence does not supply a constraint on what hypothetical worlds/situations are under discussion, why don't speakers accomodate antecedents at random. For instance, in (33c), if the accomodated antecedent were *if the Moon were made of green cheese*, the resulting conditional should count as a legitimate congruent answer as it supplies a modal relation. In other words, any simple subjunctive with an unexpressed antecedent will vacuously supply an answer.[17]

The solution to this problem, I want to argue, cannot be found by considering only the relationship between the elements of the strategy of inquiry in (33). Rather, it is necessary to realize that the initial question under discussion is a subquestion which in turn serves to address a superordinate discourse topic. For the case at hand, this more general

[17] If this is correct, it suggests that the situation with modals is rather different from that of *only*. As is discussed by Roberts, the proper domain restriction for focus-sensitive elements such as *only* does not have to be stipulated, but can be deduced fairly directly by considering which choices will yield answers that are relevant for answering the question under discussion.

question involves a comparison between the brothers in terms of their scholastic abilities. To make matters concrete, we may take this comparison to be verbalized by means of a question such as in (34).

(34) Are you as good as your brother?

This in turn means that answers to the question, *what relation does Peter bear to the exam?* will indeed be subject to the requirement that they be of relevance, not only for the immediate question under discussion, but also for the initially raised question. Hence, only if we accomodate an antecedent for the simple subjunctive which addresses the issue of comparison will the resulting conditional yield a relevant answer. An antecedent in which one brother hypothetically takes the place of the other is the most straightforward way to arrive at the required comparison. By contrast, if instead an antecedent such as *if the Moon were made of green cheese* were chosen, no **relevant** partial answer would emerge.

This view fits straightforwardly into a theory of counterfactuals such as Kratzer 1981. There, it is assumed that counterfactuals involve an empty modal base f and a totally realistic ordering source, g. If p is the antecedent of a counterfactual then this means that the modal base is determined directly as the set of worlds in which p is true. Given p, having a totally realistic ordering source entails that "all possible worlds in which the antecedent p is true are ordered with respect to their being more or less near to what is actually the case in the world under consideration" (Kratzer 1981:69). Taken by themselves, these conditions do not say much if p is implicit—that is, they will not be sufficient to restrict the range of possible antecedents p. But this is where superordinate considerations of relevance come into play. The sentence can only make a relevant contribution to the question under discussion—that is the issue of comparison between different protagonists—if the accomodated antecedent allows us to make a statement about the person in question, viz. Peter. This in turn minimally requires that the accomodated antecedent provide the presuppositions of the consequent. The totally realistic ordering source ensures that those worlds in the set are ranked higher which conform in more ways to what the actual world looks like.

The conversational background plays an important role in determining whether the accomodation of the implicit antecedent is local or global. The scenario that was introduced in the beginning of this paper is only one of a number of possibilities in which a sentence like (17a) could be uttered. In each case, though, we can safely assume that what is accomodated in the hypothesized antecedent will at the very least supply the presuppositions for the consequent. Thus, if it is part of the background information that John flunked the exam while Peter never took it, then the sentence in (17a) will require accomodation of situations in which the presuppositions of passing are satisfied, i.e. in which Peter takes the exam. In this case, then, the accomodated situations of Peter taking the exam all involve strictly local accomodation. That is to say, hearers cannot globally accomodate this proposition as it would lead to a conflict with what is known about the real world. But this doesn't always have to be so. According to the Principle of Optimal Realism proposed by Roberts 1994:18, accomodation may indeed be global—in fact, this is the default case:

(35) **Principle of optimal realism**
[...] we make the default assumption that counterfactual contexts are as much like the actual world as is compatible with what's explicitly said about them.

This principle entails that accomodated presuppositions are taken to hold at the highest level compatible with what's known about the actual world. Hence, if they are in conflict with the actual world, accomodation is only local. Otherwise, it will be global. Among other things, this predicts that a sentence like (17a) should in principle allow readings in

97 BEST COPY AVAILABLE

which global accomodation takes place. Suppose, for instance, that the sentence in (17a) is uttered against the backdrop of what may have been the case if the thunderstorm that hit Columbus and threw everything into disarray for a few days and kept students from studying had not occurred. In this case, the QUD would be something along the following lines:

(36) Who bears what relation to the exam under the premise of there not being a thunderstorm?
a. John (still) would have flunked the exam.
b. Peter would have passed the exam.

In other words, in a context of the appropriate kind, a sentence like (35b) can very well be interpreted as part of a larger strategy of inquiry which itself is hypothetical in nature. But when there is nothing known about the real world that is incompatible with Peter's taking said exam, this information can be accomodated and moreover, this accomodation is global.

How does the kind of contrast effect perceived with the B-A intonation fit into this picture? What I want to suggest is that this not "hard-wired" into the conventional meaning of this type of prosody, but instead a pragmatic effect. In particular, it can be seen as a result of a conversational implicature. Note that lack of prosodic prominence or deaccenting conveys such material is assumed to be part of what is already salient in discourse or what can generally be taken to be already known to the conversation participants. On the other hand, lack of deaccenting, i.e. prosodic prominence has the effect of highlighting something what counts as novel in comparison with what is in the common ground. Seen in that light, the A accent in examples such as (36b) marks the current statement as different in one respect or another from whatever else is explicitly or implicitly part of the strategy of inquiry being pursued. In the specific case of (36b), this gives rise to the implicature that Peter's fate is judged as novel in comparison with that of some other person who has either been made salient in previous discourse or whose existence and concomitant relation to the exam is accomodated. If, on the other hand, the utterance conveyed nothing novel in light of the kind of relation borne to the exam in question made salient in previous discourse, an A accent would be infelicitous as there is a more informative way of conveying the information. Specifically, this is the function of *too*, which links a given statement to information already part of the common ground.

(37) [Peter] would have passed the exam, too.

Note, incidentally, that with narrow focus on the modal, we can directly induce a comparison among different types of modal relations:

(38) [Peter] [would] have passed the exam.

A scenario that will make uttering such an example felicitous is one in which (given some hypothetical circumstance, for instance of having had more sleep the night before) it has already been determined that, say, John *might* have passed the exam, but the possibility of failure, even under these more advantageous circumstances, cannot be ruled out. In Peter's case, on the other hand, the possibility of failure is not deemed an option.

6 Conclusion

There is obviously much more that could be said about the accomodation of antecedents for simple subjunctives. The basic picture that has been emerging from the work of von Fintel is clear, namely that explicit interpretation rules for simple subjunctives such as the ones proposed by Kasper are neither necessary nor sufficient. Instead, it seems that the

range of accomodated antecedents is largely predictable by the kinds of constraints that govern accomodation in general, that is the pragmatic component. While von Fintel's approach attempts to assimilate accomodation to anaphoric reference—in particular to presupposed discourse topics, Roberts' perspective allows us to view the phenomenon from a more general and encompassing vantage point. For contributions to a conversation to be felicitous, they need to be able to further the interlocutors' knowledge of the way that things are in a nonrandom fashion. Clearly, simple subjunctives are no exception and the suggestions made here indicate that they can be shown to fit the patterns of coherence and informativeness if we allow for a more abstract notion of topic under discussion.

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Information Structure in Discourse: Towards an Integrated Formal Theory of Pragmatics[1]

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For many linguists interested in pragmatics, including the Prague School theorists, Halliday (1967), and Vallduví (1992,1993), *information structure* is a sentence-level structure. It is generally characterized as a variation of sentential structure along certain parameters to modulate the presentation of the information imparted by the sentence in such a way as to relate that information to prior context. The factors in that relationship are characterized in terms of primitive functional roles such as theme/rheme, focus/(back)ground, topic/link, old/new, etc. These primitives and the correlated information structure of sentences are used to explain the roles of intonational focus and of particular syntactic focus constructions, of topicalization and other displacement transformations, and of a fairly wide range of other phenomena, including, e.g., word order in relatively free word order languages such as German, the functions of distinguished structural positions in Catalan or Hungarian, definiteness in Slavic languages, specificity in Turkish, use of specific affixes such as Japanese *-wa*, etc.

Most researchers who work on focus, topic, etc., talk about their relationship to felicity, and hence to the context of utterance. But few look beyond the sentence to examine in any detail the range of kinds of contexts in which an utterance with a given focus is actually felicitous.[2] Kadmon & Roberts (1986) argued that this methodology was crucial to understanding the role of focus in interpretation. They claimed that at its most abstract, this role is that of constraining (via conventional presuppositions) what they called the *information structure* of *contexts* in which the utterance would be felicitous. This perspective on information structure stems ultimately from the work of Carlson

[1]I am grateful to the participants in my winter/sping 1995 seminar on Information Structure and Semantic Interpretation, especially Louise McNally, and also Mike Calcagno, Peter Culicover, David Dowty, Andreas Kathol, and Svetlana Vasina, for their comments and penetrating questions on earlier versions of this material. Thanks also to Paul Portner and to Nirit Kadmon for valuable comments on an earlier draft. And to the organizers and the audience for the Colloque de Syntaxe et Sémantique de Paris, October, 1995, where I presented an abbreviated version. I owe a considerable debt to Nirit Kadmon, with whom I explored many of the issues discussed here over several years, and to Stanley Peters and CSLI, Stanford University, who supported some of our work together. None of these people, however, should be assumed to agree with the proposal I offer here.

[2]Prince and her students are generally exceptions to this criticism.

(1983), though he himself realized it with a text grammar.[3] The conception I will develop here is one in which information structure is literally a structure on information -- on the inquiry pursued in discourse and the information which that inquiry yields, and not on the utterances or sequences of utterances used to present it. All that is given at the sentential level, conventionally, are certain sorts of presuppositions about the place and function of the utterance in the information structure of the discourse in which it occurs.

I first define, in §1, the intended notion of the *information structure* of a discourse in an extension of Stalnaker's (possible worlds) view of context, an extension which takes into account questions as well as assertions and imposes a pragmatically-motivated structure on well-formed exchanges. Then in §2, to illustrate how this structure provides an account for the types of phenomena classically pursued in theories of information structure, I will outline a theory of a phenomenon very directly related to information structure -- the conventional implicatures associated with prosodic focus in English utterances, and suggest how this account improves on others currently in the literature.

I will assume that information structure is a universal of human discourse, not dependent on the specific syntactic structures or other conventions which are developed in a given language to fulfill the associated functions. But the account of the meanings associated with prosodic focus in English is very language-specific; we might expect that other languages would use very different means to achieve some of the same ends, or would use similar means to encode other kinds of information. The point of combining the two accounts in one discussion is to use the second to illustrate how the first enters into the interpretation of particular utterances in particular languages. But I think that one of the virtues of the type of information structure I have in mind is that it has much broader implications for formal pragmatic theory, providing a unified foundation for accounts of phenomena otherwise considered to be quite diverse and independent of each other. In §3, I will very briefly note what I take some of its other potential applications to be, and the relationship of this proposal to a number of others in artificial intelligence, linguistics, and philosophy.

§1. Information Structure and Questions in a Language Game

Discourse is organized around a series of conversational goals and the plans, or strategies, which conversational participants develop to achieve them. This should not be surprising, given the central role granted to intentions in communication and meaning, e.g. by Grice (1989), Lewis (1969), Grosz & Sidner (1986), Planning Theorists in artificial intelligence, Sperber & Wilson (1986), and Thomason (1990); but an integrated theory of this intentional structure and its ramifications for pragmatic theory has not, to my knowledge, been developed previously.

Following Stalnaker (1979), I assume that the primary goal of discourse is communal inquiry -- the attempt to discover and share with the other interlocutors "the way things are", i.e. to share information about our world. But we must develop strategies for achieving this goal, and these strategies involve sub-inquiries. As in a game, some strategies may be better, some worse; this is largely a matter of the rationality of the participants, and not of linguistic competence *per se*. Whether strategies are effective involves, as well, an element of luck, as in any inquiry. To understand better what I have in mind, let us pursue the analogy with games.[4]

[3]After the ideas related here were worked out, I received a copy of Ginzburg (1994b), who also follows Carlson and proposes something related to the conception of information structure related here, though he doesn't call it such and takes very different turns at a number of points. His intended application seems to be more narrowly to characterize well-formed exchanges in discourse.

[4]In this, I follow Carlson (1983), though I have developed the idea somewhat differently here. Of course, ultimately the comparison of discourse to a game goes back to Wittgenstein, and has been picked up by

The principal elements of a game are its goal(s), the rules which players abide by, the moves they may make towards achieving the goals, and the strategies they may pursue in making their moves, the last generally constrained by the first three and, above all, by rational considerations. We take the aims or **goals** of a language game, as already noted, to be to come to agree on the way things are in the world. Using Stalnaker's (1979) notion of the **common ground** (the set of propositions which the interlocutors in a discourse behave as if they all hold to be true, with a proposition realized technically as a set of possible worlds) and related **context set** (the intersection of the common ground, the set of worlds where all the propositions in the common ground are true), our goal is to reduce the context set to a singleton set, the actual world. There are two types of **rules**, both viewed as constraints on the interlocutors' linguistic behavior: conventional rules (syntactic, compositional semantic, etc.), and conversational rules (e.g., the Gricean maxims). The latter are not properly linguistic, but are given by rational considerations in view of the goal of the game (e.g., the Maxim of Cooperation follows from the fact that playing the language game is a coordination problem, à la Lewis; Quality from the fact that truth is the ultimate goal; Quantity 1 from the desire to maximize the payoff of a move in view of commitment to the ultimate goal), and of human cognitive limitations (cf. Sperber & Wilson's (1986) discussion of Relevance and Quantity 2 in this light).[5] There are two types of **moves** which players may make, linguistic behaviors which fall under the kinds of acceptable behavior defined by the rules and are classified on the basis of their relationship to the goals of the game (I ignore here the general class of imperatives): what Carlson calls **set-up moves**, which are questions, and what he calls **payoff moves**, which are assertions, the answers to questions. Note that moves, on the interpretation I will give them, are not speech acts, but the semantic objects which are used in speech acts. A speech act is the act of proferring a move. I will return to discuss strategies of inquiry just below.

I assume that there are two aspects to the interpretation of any given move: its **presupposed content** and its **proffered content**. I use the term *proffered* as a cover for what is asserted in an assertion and for the non-presupposed content of questions and commands. Lewis (1969) treats questions as a type of imperative; this strikes me as correct in that a question, if accepted, dictates that the interlocutors choose among the alternatives which it proffers.[6] Most contemporary semantic analyses regard a question as denoting or determining the set of propositions which are the possible answers (or correct answers, in some theories) to the question; these are the proffered alternatives. If a question is accepted by the interlocutors, this commits them to a common goal, finding the answer; like the commitment to a goal in Planning Theory, this is a particularly strong type of commitment, one which persists until the goal is satisfied or is shown to be unsatisfiable. The accepted question becomes the immediate topic of discussion, which I will also call **the immediate question under discussion**, often abbreviated as **the question under discussion**.

Note that Stalnaker's goal of discourse can itself be viewed as a question, the Big Question, *What is the way things are?*, whose corresponding set of alternatives is the set of all singleton sets of worlds in the context set at a given point in discourse. This suggests another way of viewing the set of alternatives proffered by a question: a question sets up a partition on the context set at the point of utterance, each cell the set of worlds in which one complete answer to the question is true (cf. the use of partitions to characterize answer-sets in Groenendijk & Stokhof (1984)). Then we can view the

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others, including Lewis (1969) and, of course, Carlson's mentor Hintikka (1973,1979,1981).

[5]Here and below, I capitalize the Gricean notion of Relevance, and the related notion which I will formally define below, to distinguish them from the ordinary English term.

[6]There are also reasons one might want to treat questions and imperatives as distinct types of speech acts. Since I'm not addressing imperatives here, I won't try to argue one way or the other.

context set itself as representing the ultimate set of alternatives, for it is the selection of a unique ("actual") world which is our ultimate goal.

When interlocutors accept a question, they form an intention to answer it, which intention is entered into the common ground.[7] If a cooperative interlocutor knows of this intention, she is committed to it, i.e. she herself (ostensibly) has an intention to answer the question. Then Relevance, an organizing principle of discourse which supports coherence and hence facilitates the processing and storage of information, will lead her to attempt to answer it as soon as possible after it is asked. Grice's Quantity 1 maxim, in view of the goals of discourse, makes a complete answer preferable to a partial one.

Assertions are, as for Stalnaker, choices among alternatives. If accepted, they are added to the common ground and thereby shrink the context set. In order for discourse to be coherent (obey Relevance), it must be clear what alternatives (corresponding to cells in a partition on the context set) a given assertion selects among. The relevant alternatives are those proffered by the question, or topic, under discussion. That's the sense in which assertions are payoff moves -- they choose among the alternatives proffered by a set-up move/question, and in so doing they further the goals of the game. Non-sequiturs are assertions which don't bear on the question under discussion; even though informative in the abstract, they reflect poor strategy and a lack of commitment to the immediate goals of the discourse, i.e. a lack of cooperation. Non-sequiturs also fail to maximize pay-off; good strategists make assertions with a view to optimizing the number of relevant inferences that they will trigger, and it seems reasonable to assume that such inferences are facilitated by the discourse segmentation induced by the plan structure of the discourse (see Grosz & Sidner (1986), Sperber & Wilson (1986), though the latter don't use the term *discourse segmentation*.)

Strategies of inquiry are sequences of set-up moves, or questions, designed to (at least partially) satisfy the aims of the game, while obeying the game's constraints. Given that the main goal is to answer the Big Question, a reasonable strategy will involve a plan to do this by developing sub-goals which are easier to achieve and are logically related to each other in such a way as to facilitate achieving the main goal. We can define an entailment relation on questions, following Groenendijk & Stokhof (1984:16): One **interrogative Q_1 entails another Q_2** iff every proposition that answers Q_1 answers Q_2 as well. (This presupposes that we're talking about complete answers, for otherwise the entailments can actually go the other way around.) E.g. *What do you like?* entails *What food do you like?*. An answer to the Big Question, *What is the way things are?*, entails the answer to any other possible question. We might call Q_1 in such a relation the **superquestion**, and any Q_2 which it entails a **subquestion**. On the other hand, if we can answer enough subquestions, we have the answer to the superquestion. Given the ultimate aim of discourse and the rationality of the participants, these types of relations are the principal factors that structure our moves.

Of course, questions in discourse are generally more specific, and hence more manageable, than the Big Question. Besides the discourse goal of inquiry in its most general sense, we usually have goals in the real world, things we want to achieve quite apart from inquiry, **domain goals**. And our domain goals, in the form of deontic priorities, generally direct the type of inquiry which we conduct in conversation, the way we approach the question of how things are. We are, naturally, most likely to inquire first about those matters that directly concern the achievement of our domain goals.

[7] This is in distinction to Carlson's epistemic desideratum of a question, which has to do with increasing the knowledge of the questioner, or with the related views of Ginzburg (1994a). On the present view, it is the common ground, not the speaker, that's "informed" -- and it is mutual belief-behavior, and not knowledge, that's sought. This permits a generalization over rhetorical questions, quiz questions, etc., which are problems for more solipsistic views of information in discourse.

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Hence, domain goals tend to dictate which sub-questions of the Big Question we take up at any given point. But, as discussed above, once we've committed ourselves to a given question, i.e. we plan to answer it, then we pursue it until and unless it is either answered or it becomes clear that it isn't presently answerable. The interlocutors' strategy in this pursuit may, however, include the decision to pursue answers to sub-questions, i.e. a series of related questions may realize a strategy to get at the answer to the most general, logically strongest question among them. Hence, a strategy of inquiry will have a hierarchical structure, a set of questions partially ordered by entailment. Things are actually more complex than this, as questions in an actual strategy may be only logically related in view of certain contextual entailments. But this is the basic nature of strategies, and in what follows I will assume that they have this idealized logical structure, relativized to context.

Of course, there are many sequences of questions in discourse which are apparent counterexamples to the constrained relation posited here. For example, at a given point an interlocutor might utter one after the other a number of relevant sub-questions to some super-question, without yet answering any of them. But this is just enumeration, suggesting a plan for how to attack the super-question; none of these questions has yet been proffered or accepted. We can only address such sub-questions one at a time, and when one is being addressed, we stick to it (or can complain to interlocutors who don't and thereby "change the subject"). In another type of case, someone might have an epiphany at some point, realize how some information just discussed bears on another, now dormant question, and introduce that. This can derail the conversation, and either we later try to get back on track with the strategy we were pursuing or else we just give it up and move on. But these are violations of the rules which only underline their general force. See also the brief discussion of the questions under discussion in corrective contexts, in §2.1, where these are a type of meta-question about the discourse itself.

One of Carlson's (1983) central insights is that dialogues are functionally organized by question/answer relations, though the questions are often only implicit, inferred on the basis of other cues. We will see in the following section one way in which interlocutors can retrieve questions under discussion which are only implicit, never explicitly asked: I will argue that prosodic focus in English presupposes the type of question under discussion, a presupposition which enables the hearer, with some other contextually given clues, to reconstruct that question and its relation to the strategy being pursued. This is just one example of the general case, which is modelled more abstractly in Planning Theory via Plan Inferencing Rules that permit us to infer interlocutors' plans from other information in the common ground plus what is actually said. Similarly, sometimes answers which are obviously entailed in a given context are not explicitly uttered, but are nonetheless entered into the common ground. These cases involve **accommodation**, in Lewis' (1979) sense, and are quite normal in discourse: if it is clear that an interlocutor presupposes a question or assertion ϕ which is not yet commonly agreed upon but the others have no objection, then they behave as if the common ground contained ϕ all along. Hence, the notion of a move in a discourse game is essentially semantic. A question is not necessarily realized by a speech act, but is only a question-denotation in the technical sense that it proffers a set of relevant alternatives which the interlocutors commit themselves to addressing.[8] It tells you what the discourse is "about" at that point in the discourse, and further, if we look at the strategy of questions in which it participates, it tells us where the discourse is going.

[8]One of the nice consequences of this semantic realization of the notion of questions under discussion, as opposed to Carlson's assumption that implicit questions are actual parts of the text of a discourse, is that these more abstract questions needn't carry the types of presuppositions, especially existential presuppositions which are sometimes said to be associated with actual interrogative speech acts.

In the remainder of this section, I will first, as a preliminary to developing a view of discourse as founded on questions, sketch a semantics for questions. Then I will turn to a formal charcterization of the notion of information structure that I have in mind. Finally, in §1.3, return to a consideration of the pragmatics of questions and answers, viewed as a corollary of their roles in information structure.

§1.1 A Semantics for Questions

I adopt a semantics for questions which borrows various elements from the earlier work of Hamblin (1973), Groenendijk & Stokhof (1984), and von Stechow (1989), though it is different from each of these in important respects. As in Hamblin's account, a question will denote a set of alternatives, which I will call the *Q-alternative set* of the question. I borrow from Groenendijk & Stokhof the use of the partition established over a set of worlds by the Q-alternative set to define the notions of *complete* and *partial answer* to a question. And I adopt von Stechow's assumption that the Q-alternatives of a question are all asked by the interlocutors and that this fact influences the common ground, though I make this part of the pragmatics of what it is to accept a question instead of part of its semantic denotation as in von Stechow. This account also differs from von Stechow's and from Groenendijk & Stokhof's in that I eschew a structured semantics for questions, nor do I co-generate question/answer pairs. In this account, the intimate relation between an assertion and the question it addresses, and hence (partially) answers, is generally reflected in prosodic focal presuppositions of the assertion. The latter are argued in §2 below to be presuppositions about the role of the assertion with respect to the question under discussion in the information structure of the discourse. Throughout, I ignore the important question of how to analyze embedded questions. I assume that their semantics is different from that of main clause questions, though, of course, the two are closely related; cf. Jacobson (1995), Ginzburg (1995), and Higginbotham (1996) for some relevant discussion.

In what follows, for any constituent α, $|\alpha|$ is the regular denotation of α, arrived at by recursive, compositional rules in the usual fashion. The logical form of a question is assumed to include a wide-scope interrogation operator, **?**. Within its scope, the *wh*-clause in a question like *Who arrived?* is assumed to be *who*$_i$ λx[*x arrived*]), so that the *wh*-element is in prenex position, with the main clause interpreted as an abstract on its trace. For convenience, I will confine the *wh*-elements considered to *who* and *what*, since they are of the same semantic type. For a simple *wh*-question, the *Q-alternative set* denoted by the question is the set of propositions which can be derived by abstracting on its *wh*-phrase, then applying this abstract in turn to all the things in the model (entities, functions, whatever) which are of the same type as that denoted by the *wh*-phrase. This can be generalized as follows:

(1) **The Q-alternatives corresponding to utterance of a clause** α:[9,10]
Q-alt(α), = {p: $\exists u^{i-1}_1, \ldots, u^{i-n} \in D[p = |\beta|(u^{i-1}) \ldots (u^{i-n})]$}, where

[9]Note that this set differs from the alternatives determined by a question for von Stechow, since his alternatives vary simultaneously over both the wh-elements in the question and its focused constituents, while I have separated out these two types of variation, as will become clear in §2 below.

[10]It is not crucial here that the *wh*-elements be treated as operators. In the LFs assumed here, the role of the prenex *wh*-elements is primarily to mark their scope. Otherwise, I might have assumed that the *wh*-elements themselves are distinguished variables, following Ginzburg (1995), with a special null operator, like his *QUANT-CLOSURE* operator, unselectively binding all the free *wh*-variables at the appropriate level. The facts about scoping of *wh*-elements, especially relative to scope of other types of operators, remain unclear to me, as does the empirical content of positing null operators. Hence, I leave this issue addressed here.

α has the logical form $wh_{i,1}$-. . . -$wh_{i,n}(\beta)$, with $\{wh_{i,1}, \ldots, wh_{i,n}\}$ the (possibly empty) set of *wh*-elements in α, and
D is the domain of the model for the language, suitably sortally restricted (e.g. to humans for *who*, non-humans for *what*).

(1) defines a set of alternatives for any utterance, even non-questions. We abstract over any *wh*-elements there may be in the utterance and then permit the variables of abstraction to vary freely over entities of the appropriate sort in the model. Yes/no questions contain no *wh*-elements, so by (1) the set of Q-alternatives to a yes/no question ?(α) will be just the singleton set {|α|}.

The semantics for questions is quite simple. The denotation of a question is its Q-alternative set:[11]

(2) **Interpretation of a Question** ?α:
|?α| = Q-alt(α)

For a question like *Who did Mary invite?*, if we take *who* to be of type *e*, the Q-alternative set described would not include the answer *Nobody*, though this is presumably felicitous. So the Q-alternative set isn't necessarily the set of ALL possible answers to the question. Of course, if we assumed that *who* is of higher type, say a generalized quantifier of type <<*e*,*t*>,*t*>, then *nobody* would be of the appropriate type to give as value for the corresponding abstraction. But as we will shortly see, we won't have to assume anything about the type of *who* in order to permit such an answer.

To answer a question, we must evaluate all the elements of its Q-alternative set to see which, if any, are true. Answerhood is defined as follows:

(3) A **partial answer** to a question *q* is a proposition which contextually entails the evaluation -- either true or false -- of at least one element of Q-alt(q). A **complete answer** is a proposition which contextually entails an evaluation for each element of Q-alt(q).

Suppose we have only two propositions in the Q-alternative set for some question, *p* and *q*. The set of complete answers to the question are those which entail one member of the set in (4):

(4) {(p & q), (p & ¬q), (¬p & q), (¬p & ¬q)}

Note that this set establishes a partition on any given set of possible worlds, including the context set for a given utterance; for in any given world, one and only one of these four possible formulae can be true, and in an interesting set of worlds, there will be some in which each of these formulae is true. Each complete answer corresponds to a cell in the partition and its acceptance leads to discarding all the other cells, as in the informal definition (1) in the preceding section.

To illustrate, consider the following example:

[11] I adopt this semantics without argument here. It is just the simplest type of denotation for questions consistent with the alternative semantic account of focus and questions which I develop below. Nothing in the proposals about Information Structure and focus hinges on (2), so that one might substitute another type of interpretation for questions.

(5) Who did Mary invite? logical form: ?[Who (λx Mary invited x)]

(6) [?[Who did Mary invite]] = Q-alt[Who (λx Mary invited x)] =
{p: $\exists$u $\in$ D[p = λx Mary invited x(u)]} =
{Mary invited u: u $\in$ D}

If the proffered (5) is accepted by the interlocutors, they will then be committed to answering the question, i.e. evaluating all the alternatives it proffers. Suppose that there are only three people in the model, so that D = {Mary, Alice, Grace}, then Q-alt(5) will be the set in (7) (assuming the relation denoted by *invite* is irreflexive, and ignoring joins of individuals in the model):

(7) {Mary invited Alice, Mary invited Grace }

If we take *Mary invited Alice* to be *p*, and *Mary invited Grace* to be *q*, then (5) corresponds to the partition suggested by (4). If the partition is established on a reasonably rich context set, the set of complete answers will include *Mary invited Alice and Grace*, *Mary invited Alice but not Grace*, *Mary invited Grace but not Alice*, and *Mary invited no one*, the last of these picking out the cell corresponding to the formula $\neg p \ \& \ \neg q$. A partial answer would be an utterance whose truth rules out at least one of the cells of the partition; e.g., *Mary didn't invite Grace*, ruling out both of the cells in which *q* is true but leaving open the question of whether Mary invited Alice. All complete answers are partial answers, but not *vice versa*.

Given the way we have defined answerhood in (3), we can define some other useful terms for discussing questions:

(8) A question q_1 **entails** another question q_2 iff answering (i.e., giving an answer to) q_1 yields a complete answer to q_2.
[cf. Groenendijk & Stokhof 1984:16]

(9) A question q_1 **contextually entails** another q_2 iff answering q_1 in a discourse context with common ground *c* (a set of propositions) is such that $c \cap$answer(q_1) entails a complete answer to q_2.

I will assume without argument that an utterance may partially answer a question either by directly asserting a partial answer, by contextually entailing a partial answer, or by presupposing or conversationally implicating something which contextually entails a partial answer to the question.

The semantics for questions I have given in this section is essentially static. It will serve the purposes of the static view of information structure presented in the following section. However, in §1.3, I will consider the question of how presuppositions are projected in questions, and this will necessitate a dynamic view of questions and of the information structure in which they play a role. Hence, I will present a context change potential for questions in dynamic information structure. However, though defining an update function over a set of q-alternatives is rather more complex than giving static semantic interpretations, the simple semantics presented here still represents the heart of the proposal, along with the notions of answerhood and of question entailment.

§1.2 A formal theory of information structure

In this section, I will explore a formal definition of the **information structure** of a discourse, taking it to be the set of moves in the discourse, both questions and answers, explicit and implicit (pragmatically retrieved), along with various functions and relations on them, including the structure induced by the strategy or strategies which order the questions. The question/answer relation gives us pairs of moves, the pairs in turn partially ordered by the strategic relation on the questions. Note that just as questions may be only indirectly "asked", answers may in fact be provided by a sequence of one or more assertions; deriving an answer may even require inferences drawn on the basis of such sequences, so that the structure is more complex than that of a simple question/answer dialogue, though I cannot investigate such matters in detail here.

There are a couple of ways I could imagine defining information structure formally. Here is one:

(10) The information structure for a discourse D is a tuple,
InfoStr$_D$ = < M , Q , A , < , Acc , CG , QUD >, where:[12]

M is the set of (setup and payoff) moves in the discourse.

Q $\subseteq$ M is the set of questions (setup moves) in M, where a question is a set of propositions.

A $\subseteq$ M is the set of assertions (payoff moves) in M, where an assertion is a set of possible worlds.

< is the precedence relation, a total order on M; $m_i < m_k$ iff m_i is made/uttered before m_k in D; the order of any two elements under < will be reflected in the natural order on their indices, where for all m_i, $i \in N$.

Acc $\subseteq$ M, is the set of accepted moves.

CG is a function from M to sets of propositions, yielding for each $m \in M$ the common ground of D just prior to the utterance of m. Further, we require that:

a. for all $m_k \in M$, $CG(m_k) \supseteq \cup_{i<k}(CG(m_i))$,

b. for all $m_k \in M$, $CG(m_k) \supseteq \{m_i: i<k \text{ and } m_i \in Acc\backslash Q\}$, and

c. for all $m_k, m_i \in M$, $i<k$,

i. the proposition that $m_i \in M$ is in $CG(m_k)$,

ii. if $m_i \in Q$, the proposition that $m_i \in Q$ is in $CG(m_k)$,

iii. if $m_i \in A$, the proposition that $m_i \in A$ is in $CG(m_k)$,

iv. if $m_i \in Acc$, the proposition that $m_i \in Acc$ is in $CG(m_k)$,

v. for all propositions $p \in CG(m_i)$, the proposition that $p \in CG(m_i)$ is in $CG(m_k)$, and

vi. whatever the value of $QUD(m_i)$, the proposition that that is the value of $QUD(m_i)$ is in $CG(m_k)$.

[12]One might want to define a discourse as the set of explicit moves made in a period of time between a set of interlocutors. In that case, there might be different sets of possible implicit interpolated moves that the interlocutors could "agree" on, with different resulting information structures. Hence, one would talk not about *the* information structure for the discourse, but about *an* information structure for the discourse. In what follows, I assume that a discourse consists of all the moves made within it, implicit as well as explicit, though this isn't crucial. In either case, one might also add a set *Exp* to the tuple, the subset of M which consists of all the explicit moves in the discourse.

QUD, the questions-under-discussion stack, is a function from M (the moves in the discourse)[11] to ordered subsets of Q∩Acc such that for all m ∈ M:

a. for all q ∈ Q∩Acc, q ∈ QUD(m) iff

i. q < m (i.e., neither m nor any subsequent questions are included), and

ii. CG(m) fails to entail an answer to q and q has not been determined to be practically unanswerable.

b. QUD(m) is (totally) ordered by <.

c. for all q, q' ∈ QUD(m), if q < q', then the complete answer to q' contextually entails a partial answer to q.

Since we are only considering questions and assertions, I will assume that the set of assertions in D is the complement of Q in M.

Note that not all moves in a discourse are necessarily accepted, so that Acc will generally be a proper subset of the set of M. Presumably, we keep track of proposed questions and assertions, even if they're rejected, an accounting which is crucial, e.g., in explaining denials and corrections. But unlike Carlson's view of discourse, the moves that we keep track of are semantic entities, the information expressed by the utterances in the discourse, and not structural analyses of those utterances. This seems desirable in view of the psycholinguistic literature which suggests a fairly rapid loss of structural information about preceding discourse.

The constraint on the value of CG for any move, making it a super-set of the common ground for any previous move, guarantees that the common ground will be monotonic, preserving information contributed earlier. Of course, discourse isn't always monotonic in this sense, but I will ignore this problem here. We also require that the common ground include all those previous accepted moves which are not questions, i.e. the previous accepted assertions, in keeping with Stalnaker's characterization of what it is to accept an assertion. By making the common ground a possibly proper superset of previous common grounds and of the set of accepted assertions, we leave open the possibility that additional information is added not only by accepted pay-off moves/assertions, but also possibly by accommodated implicatures, inferences, common perceptual experience, etc. Clause (c) is intended to capture the fact that at any given point in the discourse, the interlocutors have complete information about the information structure itself, including what moves have been made, which were questions and which assertions, which were accepted, what was in the common ground at the point a given move was made, and what questions were under discussion at that point.

The set of questions under discussion at a given point in a discourse is modelled using a push-down store, which I call the **QUD stack**. Intuitively, QUD yields the ordered set of all as-yet unanswered but answerable, accepted questions in Q at the time of utterance of q. When we accept a question, we add it to the top of the stack. Its relationship to any question previously on top will be guaranteed by a combination of Relevance, entailing a commitment to answering prior questions, and logical constraints on the way that the stack is composed. If we decide to pursue an accepted question by asking a sub-question, we may add the sub-question to the stack, so that the stack reflects (part of) a strategy of questions. When a question is answered or determined to be practically unanswerable, it is popped off the stack, revealing any below it. At any point in discourse, the question on top of the stack is the (immediate) question under discussion.

[11] Even assertions or questions which are rejected by the participants can be determined to have been felicitous (or not) in terms of their relation to the Information Structure of the discourse in which they occur. Hence, the domain of QUD isn't restricted to the accepted moves.

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I will discuss directly below the motivation for clause (c) in the definition of QUD. But first, so that this discussion is not entirely abstract, let me illustrate how the QUD stack works with a very simple and rather excessively explicit discourse. This example presupposes a model with only two individuals, Hilary and Robin, and two kinds of foods, bagels and tofu. I assume that each of the questions in the discourse (D_0) is accepted by the interlocutors:

(D_0) 1. Who ate what?
a. What did Hilary eat?
a_I. Did Hilary eat bagels?
Ans(a_I) *Yes.*
a_{II}. Did Hilary eat tofu?
Ans(a_{II}) *Yes.*
b. What did Robin eat?
b_I. Did Robin eat bagels?
Ans(b_I) *No.*
b_{II}. Did Robin eat tofu?
Ans(b_{II}) *Yes.*

This entire discourse realizes a strategy to answer the first question, move ($D_0$1); here, the questions involved stand in simple entailment relations. For each question in (D_0), the set of questions which it entails is given below. (These relations are also reflected in the indentation hierarchy in the layout of the discourse.):

$\models(1) = \{a, a_I, a_{II}, b, b_I, b_{II}\}$
$\models(a) = \{a_I, a_{II}\}$
$\models(b) = \{b_I, b_{II}\}$

Note also that the following facts hold in the model described:

(11) Given that the domain of the model = {hilary, robin, bagels, tofu}, then
Ans(a_I)∩Ans(a_{II}) = Ans(a), i.e. giving complete answers to (a_I) and (a_{II}) yields a complete answer to (a). Answering (a_I) hence yields a partial answer to (a), and similarly for (a_{II}).
Ans(b_I)∩Ans(b_{II}) = Ans(b), i.e. giving complete answers to (b_I) and (b_{II}) yields a complete answer to (b). Answering (b_I) hence yields a partial answer to (b), and similarly for (b_{II}).
Ans(a)∩Ans(b) = Ans(1), i.e. giving complete answers to (a) and (b) yields a complete answer to (1). Answering (a) hence yields a partial answer to (1), and similarly for (b).
Since partial answerhood is transitive under (1), answering (a_I), (a_{II}), (b_I), or (b_{II}) yields a partial answer to (1).

Intuitively, it is partly because of these four facts that (D_0) realizes a successful strategy for answering (1). As each question in (D_0) is asked, it is added to the QUD stack, with (1) on the bottom. When a sub-question is answered, e.g. (a_I), that question is popped from the stack and the answer added to the common ground. When (a_I) and (a_{II}) have been answered, the common ground then entails the answer for (a), as stated in the first fact in (11), and then (a) is popped as well. When both (a) and (b) have been answered in this way, the common ground yields the answer for (a), as reflected in the third fact in (11); then (1) is popped as well, leaving the QUD stack empty (insofar as this discourse comes out of the blue).

The logical relations among the questions in (D_0) are also what guarantee that the QUD stack for (D_0) satisfies clause (c) in the definition of QUD, which basically requires that higher questions on the stack be sub-questions of the lower, previously accepted questions on the stack. The ordering function $<$ in $InfoStr_{D0}$ yields the total order $<1,a,a_I,Ans(a_I),a_{II},Ans(a_{II}),b,\ b_I,Ans(b_I),b_{II},Ans(b_{II})>$, and the QUD function is as follows:

QUD(1)	=	∅
QUD(a)	=	$<1>$
QUD(a_I)	=	$<1,a>$
QUD(Ans(a_I))	=	$<1,a,a_I>$
QUD(a_{II})	=	$<1,a>$
QUD(Ans(a_{II}))	=	$<1,a,a_{II}>$
QUD(b)	=	$<1>$
QUD(b_I)	=	$<1,b>$
QUD(Ans(b_I))	=	$<1,b,b_I>$
QUD(b_{II})	=	$<1,b>$
QUD(Ans(b_{II}))	=	$<1,b,b_{II}>$

To satisfy clause (c) of the definition of QUD, in each of the ordered sets just listed, each element must be such that its complete answer entails a partial answer to any element to its left. So, given $<1,b,b_{II}>$, answering (b_{II}) must entail a partial answer to (b) as well as to (1), and answering (b) must entail a partial answer to (1), etc. This is exactly what the facts in (11) tell us.

We can now define the notion of a *strategy of inquiry* relative to some topic, or question under discussion, in terms of the QUD function, as follows:

(12) For any question $q \in Q \cap Acc$, **Strat(q)**, the strategy of inquiry which aims at answering q, is the ordered pair $<q,S>$, where S is the set such that:

If there are no $q' \in Q$ such that $QUD(q') = <\ldots q>$, then $S = \emptyset$;

otherwise, for all $q' \in Q$, $QUD(q') = <\ldots q>$ iff $Strat(q') \in S$.

We might read the ordered pair which Strat yields for a given question q, $<q,S>$, as 'the strategy to answer q by conducting the set of sub-inquiries in S'. For (D_0), Strat yields:

Strat(a_I)	=	$<a_I,\emptyset>$
Strat(a_{II})	=	$<a_{II},\emptyset>$
Strat(a)	=	$<a,\{<a_I,\emptyset>,<a_{II},\emptyset>\}>$
Strat(b_I)	=	$<b_I,\emptyset>$
Strat(b_{II})	=	$<b_{II},\emptyset>$
Strat(b)	=	$<b,\{<b_I,\emptyset>,<b_{II},\emptyset>\}>$
Strat(1)	=	$<1,\{<a,\{<a_I,\emptyset>,<a_{II},\emptyset>\}>,<b,\{<b_I,\emptyset>,<b_{II},\emptyset>\}>\}>$

The final line tells us that (D_0) involves a strategy to answer (1) by conducting two sub-inquiries, that of answering (a) by answering (a_I) and (a_{II}), and that of answering (b) by answering (b_I) and (b_{II}). Because of the answerhood relation required by the definition of QUD and the way that Strat is defined in terms of QUD, we are assured that any question q is part of a strategy to answer a question q' only if a complete answer to q will contextually entail a partial answer to q'. It may be that there are more complex types of strategies whose characterization requires ordering the second element in the ordered pair

<q,S>, but I won't investigate that here. Basically, rational considerations, in connection with the information available in the common ground (and hence, what kinds of contextual inferences may potentially be drawn) will determine whether a strategy is well-formed.

Note that we wouldn't want to strengthen clause (c) with the requirement that all questions on a QUD stack entail those higher on the stack. This is illustrated by discourses like that in (13):

(13) CG(A) ⊇ {John is allergic to clams, one won't eat anything one is allergic to, one will eat something unless one has some reason not to}
A: What kinds of seafood will John eat?
B: Isn't John allergic to clams?

Here, A's question doesn't entail an answer to B's. There might be reasons why John won't eat clams, even if he isn't allergic to them; e.g. John might keep kosher. If the answer to B is *Yes, he is*, then this will contextually entail, in combination with the common ground for the discourse, that John won't eat clams, yielding a partial answer to A. However, if the answer to B is *No, he isn't*, that won't by itself tell us that John WILL eat clams. *Prima facie* this suggests that the requirement in (10d) may be itself too strong. But I think this apparent problem is resolved if we see that an answer to B is a partial answer to the question (14):

(14) What reasons would John have for not eating clams?

(14) in turn is a way of exploring whether John will eat clams, given the assumption that one eats whatever one has no reason not to; hence an answer to (14) contextually entails a partial answer to (13A). I take it that (13B) implicitly assumes a bridging question like (14), making the resulting discourse well-formed under (10d).

As defined, the QUD function does not, and should not, require that it order a continuous sequence of questions. At any given time, QUD may not represent the entire strategy of inquiry with respect to the question on the "bottom" of the stack (i.e., the superquestion): some sub-questions may have already been answered, i.e. parts of the strategy already realized, so that they are no longer on the stack. E.g., in (D_0) after answering (a) via answering (a_1) and (a_n), all these questions pop off the stack when we turn to address (b), but they are still part of the strategy for answering (1). Also, in defining QUD, I assumed that a question is popped off the stack if it is answered or determined to be (practically) unanswerable. A question may also be popped off the stack if some question lower in the stack is answered, even if the answered question doesn't directly entail the "higher" questions popped. This makes sense if we see the QUD stack as a fragment of a larger strategy. If we are committed to each question in turn, then each subsequent question must help to answer those already on the stack, even if indirectly. But our commitment is really to the overall strategy, so that commitment to individual questions is relative to our commitment to the earlier questions on the stack below. Then answering a lower question q relieves us of our commitment to any higher questions in *Strat*(q). E.g., in (13), if C follows B's question with *John keeps kosher*, then the interlocutors may drop the unanswered question of whether John is allergic to clams, since they are most interested in the larger question (13A), to which they now have a partial answer.

In view of what I said earlier about how questions structure discourse, we also want to guarantee that all of the non-question moves, i.e. the assertions, in a discourse are at least partial answers to accepted questions, and that in fact each is a (partial) answer to the question under discussion at the time of utterance. This will follow from the way that Relevance is defined within the framework of information structure. Suppose we define

the (immediate) question under discussion at the time of a move m to be *last*(*QUD*(m)), i.e., the last question in the ordered set *QUD*(m). We can now characterize the notion of Relevance in terms of the question under discussion at a given time (cf. Grice's relativization of his Maxim of Relevance to "the purposes of the discussion") and what it is to address such a question:[14]

(15) A move m is **Relevant** to the question under discussion q, i.e. to *last*(*QUD*(m)), iff m either introduces a partial answer to q (m is an assertion) or is part of a strategy to answer q (m is a question).

Cooperative speakers strive to make their utterances Relevant, in keeping with the goals of the game. From this it follows that each move in a felicitous discourse, one with a proper information structure, will be Relevant to the question under discussion at the time of its utterance. So, each assertion in such a discourse will provide at least a partial answer to the question under discussion, as desired. Further, (15), in connection with clause (c) of the definition of QUD in (10), captures the commitment involved in accepting a question: Given (c), a question cannot be removed from the set of questions under discussion unless it's answered or unanswerable; given Relevance, we know that a question can only be accepted if it furthers answering those to which the interlocutors are already committed, thereby perpetuating that commitment.

Instead of the static characterization of the information structure of a discourse which I have developed above one could define information structure in context change terms, a view which I plan to develop in subsequent work. One advantage of the the static characterization is that it offers a more global view, facilitating discussion of properties of InfoStr *per se*, apart from issues of context change; however, I believe that a more dynamic view yields other types of insight, especially pertaining to presupposition projection in questions.

§1.3 Pragmatics of Questions in Information Structure

The account sketched in §1.1 derives the same end result as that given by von Stechow (1989), though it does so by drawing the line between semantics and pragmatics differently. If we were to adopt the central features of his account apart from structured propositions, the semantics for questions would be as in (16):

(16) **Interpretation of a Question** $?(\alpha)$, following von Stechow (1989):
$[\![?\alpha]\!] = \{w \mid \text{every } p \in \text{Q-alt}(\alpha) \text{ is asked in } w\}$.

von Stechow's denotation of a question is a proposition: the set of worlds where every proposition in the corresponding set of Q-alternatives is asked. If a question is accepted by the interlocutors, this means that all the propositions in its Q-alternative set are asked. Under (16), the denotation of (5) would be as follows:

[14]This calls out for comparison with Sperber & Wilson's (1986) notion of Relevance. A detailed comparison is not possible here, but I will note two significant differences between their notion and that given in (15): First, Sperber & Wilson's Relevance reflects their reductionist program, since it is intended (so far as I can understand) to play the role of all of the original Gricean conversational maxims. (15) is not reductionist; e.g., it is not intended to account for Quantity implicatures. Second, Sperber & Wilson do not relativize their notion to the interlocutors' immediate intentions or goals (and in fact, they deny the very possibility of a common ground), so that the maximization of informativeness while minimizing processing cost is calculated absolutely. But the Relevance defined in (15) is, crucially, relativized to the question under discussion by the interlocutors, and hence, given the pragmatic function of questions in information structure, to the interlocutors' goals.

(5) Who did Mary invite?

|?Who did Mary invite| = {w | every p ∈ Q-alt(Who did Mary invite) is asked in w} =
{w | every p ∈ {Mary invited u: u ∈ D} is asked in w}

With D = {Mary, Alice, Grace}, as above, the question would have as denotation the set of worlds in (17) (assuming again that the relation denoted by *invite* is irreflexive, and ignoring joins of individuals in the model):

(17) {w | Mary *invited Alice* and *Mary invited Grace* are both asked in w}

We might reasonably assume that von Stechow's questions, like other propositions, would contribute directly to the common ground, so that the prior context set would be reduced to include only those worlds in which all the Q-alternatives of α are asked. This has the virtue of relating the acceptance of a question to the common ground. But what is it for a proposition to be "asked" in a world? von Stechow doesn't say, but perhaps it's this: If a proposition is asked, the interlocutors attempt to evaluate its truth. On this view of what asking is, (16) would entail (21). If a question is accepted, the common ground will be updated with the information that the interlocutors are committed to determining which of its Q-alternatives, if any, are true. But notice that this same incremental effect on the common ground, while not semantic, will still follow directly from the pragmatics for questions in (21) in conjunction with the semantics for questions in (2), the definition of an answer in (3), and the relationship between information structure and common ground discussed in §1.1. Once a question is accepted, so that by (21) its Q-alternative set under (2) is added to the QUD stack of the information structure, the interlocutors are committed to answering it (until and unless it's determined to be unanswerable). Answering a question entails giving an evaluation of all of the propositions in its Q-alternative set; hence a commitment to answering involves asking each of those propositions, in the sense just defined. Recall that I assumed that the information structure of a discourse is known to all interlocutors, so that propositional information about it is in fact part of the common ground (see the clauses in (c) of the definition of *CG* in (10)); hence, the common ground will also entail that the question's Q-alternatives are asked. So the present account yields the same results as von Stechow's, but separates out pragmatic from semantic aspects of the contribution of questions to discourse.

Recall that a question is, in some respects at least, like an imperative, and this proposal for the semantics for questions, like von Stechow's, should be judged partly in that light. If accepted, an imperative commits the hearer to trying to make the corresponding assertion true; i.e., it commits the hearer to a certain domain goal. If accepted, a question commits the hearer to trying to add its answer to the common ground; i.e., it commits the hearer to a certain discourse goal. Saying that the acceptance of a question involves a commitment on the part of the interlocutors would suggest that we could answer a question with a refusal, just as we can refuse to accept an imperative. That seems right, and is compatible with both the treatment in (2)/(21) and that in (16). However, if we say that the proffered content of a question is a proposition, as in (16), this would also suggest that we could deny its truth, as with assertions. But, though we can answer imperatives with "No", it doesn't seem quite right to me to refuse a question by denying its truth, as in, "No, it's not true that I'm committed to discussing that question". This is the only empirical evidence that I'm aware of in favor of the more pragmatic account developed here, involving (2) and (21), over the more semantic accounts in (16) or von Stechow (1989). It is possible that careful consideration of the facts about indirect questions will bear on this issue, as well, but that remains to be seen. The principal reason I have adopted the pragmatic account is in virtue of the way that its treatment of the pragmatics of questions parallels the elegant treatment of assertion by Stalnaker,

while avoiding the complications of structured propositions. Whatever we make of these considerations, I do think that utterance of a question, when it is accepted by the other interlocutors, at least has von Stechow's effect indirectly. Knowing what a question is, and what it is to accept it, the interlocutors know that this is the question under discussion.

There are a number of other important aspects of the pragmatics of questions which I do not have the space to discuss in detail here. See Groenendijk & Stokhof (1984), Ginzburg (1995) for discussions of some of these, Roberts (in preparation) for an extended examination within the present framework. One of these aspects, not resolved elsewhere in the literature so far as I know, is part of the motivation for the way in which the semantics of questions is formulated in the present account, and is directly relevant to the relationship between presupposed and proffered meaning posited in the Information Structure framework. This is the question of how presuppositions project in questions, and in particular, of how it is that questions are holes to presupposition, in the sense of Karttunen (1973). I.e., a question with the logical form $?\alpha$ has all the presuppositions of α. Given the semantics for questions I proposed in §1.1, we might expect that all of the q-alternatives of $?\alpha$, i.e. the instantiations of α, would carry the presuppositions of α, but that doesn't explain why the entire question inherits them as well.

By presupposition, I have in mind the phenomenon described by Stalnaker (1979) and Heim (1983,1992). An utterance of ϕ presupposes proposition p iff ϕ is felicitous in any given context c only when c entails p. In order for the context to entail p, the context set should be a subset of p. Note that the presupposition projection properties of questions do not automatically follow from the sort of treatment exemplified by the von Stechow (1989) semantics in (16), even though in it the proffered content of the question is directly added to the common ground. The proferred content itself is only indirectly related to one of the question's q-alternatives. It doesn't automatically carry along the presuppositions of those q-alternatives, because there is nothing in his semantics that would prevent the interrogative operator itself from being a plug to presuppositions, blocking them from projecting to the entire question.

In Heim (1982,1983,1992), presuppositional felicity for assertions follows from their context change potentials. For example, in order to calculate the context change for an assertion with negation, you first have to temporarily update the context set at the time of utterance with the material under the scope of negation, then subtract the resulting context set from the actual context set:

(18) **Heim's (1992) Context Change Potential for Negation**

$c + not\ \phi$ is defined just in case $c + \phi$ is,

in which case $c + not\ \phi = c \setminus (c + \phi)$.

But the function determining update of contexts, and hence $c+\phi$, is only defined when all of the presuppositions of the assertion to be added, ϕ, are entailed by the context set. So the very possibility of updating the context with the negative assertion in her technical sense requires the satisfaction of any presuppositions of material under the scope of negation. One can argue that by making the facts about presupposition projection follow from the nature of the update operation and the standard semantics for negation, Heim has explained the presupposition projection properties of negative assertions. This is the type of explanation we want for the presupposition properties of questions, as well. I can't see a non-stipulative way to incorporate such an account into von Stechow's semantics. But a dynamic version of Information Structure has the potential to offer such an account, although it will have to await further work.

Finally, one thing which has long puzzled me is how posing a question affects the context of the discourse in which occurs, in view of the question's denotation. The theory of information structure outlined above suggests an answer, one which is related to von Stechow's semantics for questions. Recall Stalnaker's pragmatics of assertion, paraphrased in (19):

(19) **Pragmatics of Assertion:** (following Stalnaker 1979)
If an assertion is accepted by the interlocutors in a discourse, it is added to the common ground at that point in the discourse. I.e., in discourse D with InfoStr_D, for payoff move m_i and the subsequent move m_{i+1}, if $m_i \in \text{Acc}_D(m_{i+1})$, then $m_i \in \text{CG}_D(m_{i+1})$.

(19) is the pragmatics for a pay-off move. Then for set-up moves, we adopt the parallel (20):

(20) **Pragmatics of Questions:**
(a) If a question is accepted by the interlocutors in a discourse, then it is added to the set of questions under discussion. I.e., in discourse D with InfoStr_D, for question move m_i and the subsequent move m_{i+1}, if $m_i \in \text{Acc}_D(m_{i+1})$, then $m_i \in \text{QUD}_D(m_{i+1})$.
(b) A member of the set of questions under discussion in a discourse D is removed from that set iff it is either answered or determined to be unanswerable. I.e., in discourse D with InfoStr_D, for moves m_i, m_k and m_{k+1} such that $m_i < m_k < m_{k+1}$ and $m_i \in \text{QUD}_D(m_k)$, $m_i \notin \text{QUD}_D(m_{k+1})$ iff $\cap(\text{CG}(m_{k+1})) \subseteq \alpha$, α a complete answer for m_i, or $\cap(\text{CG}(m_{k+1})) \subseteq \pi$, π the proposition that m_i is unanswerable.

Addition to the QUD stack entails a strong commitment to answering the question. If a question is accepted by the interlocutors, they are committed to answering it; unless it is determined to be unanswerable, it will remain on the stack until answered. Since the InfoStr containing the QUD stack is reflected in the common ground, the fact of this commitment is reflected there as well. Finally, given the way entailment among questions and answerhood are defined, in case a question is removed from the QUD stack, any questions it entails are removed from the QUD stack, as well. Note that (19) and (20) are only the principal pragmatic effects of questions and assertions; there are others, as well. E.g., if a question is asked, the fact that it is asked is entered into the common ground, whether or not it is accepted, this by virtue of the fact that the asking is a speech act performed in full knowledge of all the interlocutors, and that such (non-linguistic) shared information is also represented in the common ground. And if the question is accepted, then the interpretation of the question and the fact that it was added to the set of questions under discussion at that point also becomes part of the common ground, by virtue of the way that the character of the changing InfoStr is continuously reflected in the common ground.

§2. Focus and Information Structure

§2.1 The Presuppositions of Prosodic Focus in English

Skillful interlocutors in discourse expend a good deal of effort making sure that at any given point all the participants are clear about what the common ground is like, including

what they are talking about (the question under discussion), and how what they're talking about relates to the rest of the information in the common ground (the strategy of inquiry they're following and its general relationship to the information structure of the discourse). As Mike Calcagno (p.c.) pointed out, in a competitive game players hide their strategies; in a cooperative game they make their strategies explicit. Language is cooperative, even when we're using it to compete. Redundancy helps to assure that the cooperation in sharing information is effective.[15]

One of the tools we use to realize desirable redundancy is presupposition, which also serves to help give coherence to discourse, as we will see. Recall that utterance of a linguistic expression ϕ is only felicitous if the context of utterance entails the presuppositions of ϕ. This means that when an utterance has a presupposition, this is a conventional redundancy -- the presupposition is already at least entailed by the context, if not explicitly part of the common ground. But this built-in redundancy of presuppositions can be used, as has often been noted, to actually introduce information which was only implicitly assumed previously, or even not previously introduced at all. If an utterance has a conventionally expressed presupposition, it is often quite clear what the context should be like in order for it to be felicitous. And if the context isn't quite like that but the hearer is cooperative and has no objection to the truth of the presupposed information, she will accommodate it -- behave as if the context included that information all along, and hence as if the utterance which triggered the presupposition were felicitous. Consider the gossip's use of factive verbs to introduce scandalous information with impugnity -- *Isn't it shocking that Mary has run away from home?*.

I will argue here that intonational focus in English is presuppositional, giving information about the type of information structure in which the utterance associated with it occurs and its role in that structure. It is thereby redundant, given the fact that the information structure is in principle common information. And interlocutors use this redundancy to indirectly convey information about the information structure they intend. The main idea is that assertions, like questions, are conventionally associated with a set of alternatives, although these alternatives are presupposed by the prosody rather than proffered as are the Q-alternatives of questions. Focal alternatives are calculated on the basis of the placement of prosodic focus in the utterance, along lines similar to those developed in the theories of Rooth (1985,1992) and von Stechow (1989), among others. It has long been noted (see, e.g., Jackendoff (1972)) that in question/answer pairs, the prosody of the answer constrains the questions which it can answer; in this theory, as in the others just cited, this relationship will be reflected in a condition on the relationship between the alternatives associated with each member in the pair, the Q-alternatives of the question and the focal alternatives of the answer. Also, it has been occasionally noted in other connections (cf., e.g., the discussion of yes/no vs. alternative questions in von Stechow (1989)) that the set of alternatives proffered by a question may depend in part on its prosody. This is reflected in the present theory in the assumption that prosody plays a role in determining a set of focal alternatives for questions, as well as for assertions. In a question these alternatives constrain the type of super-question it may be related to in the strategy of inquiry. Hence, this is an alternative semantics account of prosodic focus. However, it differs from other recent accounts along these lines (Rooth (1985), von Stechow (1989), Krifka (1992)) in that it does not assume any direct focus sensitivity for particles like English *only* or *even*, or in the other operators and particles discussed in the extensive linguistics literature on focus. In this respect, it is in the same vein as the recent work of Rooth (1992), Schwarzschild (1994a,1994b) and von Fintel (1995), who also attempt to derive certain focus effects pragmatically, though they develop different mechanisms.

[15]For an enlightening discussion of the value and role of informational redundancy in discourse, see Walker (1993).

I am explicitly confining myself here to discussion of the role of English prosodic focus, and hence am not making claims about some universal linguistic phenomenon, Focus. With Rooth (1996), I would argue that instead we need to give detailed analyses of particular conventional elements in particular languages. However, I do assume that information structure is a universal of human discourse. And the persistent intuitions on the part of researchers that there are universals of information structure (topic, focus, theme/rheme, etc.), plus the persistent linkage of focus with the question/answer paradigm, need to be explained. If we assume that discourse has a functional structure of the sort I'm proposing, then we can go quite a bit of the way towards explaining these intuitions, while leaving open the possibility that syntactic constructions and other conventional factors in various languages contribute to fulfilling these functions in somewhat different ways.

Let me briefly sketch what I mean by English intonational focus. Then I will turn to a more detailed proposal of how the presuppositions arise and what their content is. I will make the following, somewhat simplified assumptions about the prosodic phonology of focus:[16]

(22) The Phonology of Focus:
- (a) There is at least one intonation phrase per sentential (or sentential-fragment) utterance.
- (b) There is at least one focused sub-constituent (possibly non-proper) per intonation phrase. This **focused constituent** is marked with the feature *F* in what follows.
- (c) There is at least one pitch accent per focused constituent, associated with a subconstituent.
- (d) Every pitch accent must be associated with material in a focused constituent.
- (e) There is one phrase accent (H- or L-) and one boundary tone (H or L) per intonation phrase.[17]
- (f) The string-final pitch accent in the focused constituent is assigned the most prominent stress in the intonation phrase (Nuclear Stress Rule).

All of the following prosodic factors are probably pragmatically (and hence potentially, semantically) significant:

(23) Pragmatically Significant Prosodic Factors:
- (a) the choice of intonation phrase constituent(s) (which I tentatively assume are always correlated with syntactic constituents); and
- (b) within the intonation phrase,
  - (i) the choice of focused constituent,
  - (ii) the placement of pitch accent(s),
  - (iii) the choice of pitch accent(s), and of phrase accent and boundary tone.
- (c) the relative prominence of different intonation phrases, both within an utterance and across utterances.

[16]See Selkirk (1984) for a fairly detailed exploration of the issues and discussion of many valuable examples; my assumptions about prosody are adopted from her work, except where noted. Selkirk's work, in turn, relied heavily on the work of Pierrehumbert (1980) on the phonology of tone, including pitch accents; see also Liberman & Pierrehumbert (1984).

[17]In Liberman & Pierrehumbert (1984), boundary tones are realized at the end of their associated intonation phrase, while phrase accents effect a transition between the last pitch accent in the intonation phrase and the boundary tone. See Beckman & Ayers (1994) for a somewhat different account, involving intermediate intonation phrases, as well.

Though I will concentrate in this section on the significance of the selection of focused constituent, the other factors are surely important to a full understanding of the phenomena usually grouped under the term "Focus", and in §2.2.2.2 I will note the crucial role in certain examples of (23a) and (23c), the choice of intonation phrase constituents and their relative prominence within an utterance.[18]

The above assumptions reflect the fact that all English utterances bear prosodic focus (tonal and rhythmic prominence) on at least one constituent, though that focus may be broad or narrow (see Ladd (1980) and examples below). In keeping with this and with the methodological principle of semantic compositionality, the theory I offer aims to give a unified account of the semantics of English prosodic focus across all utterance types, whereas most theories address only one or two contexts of use and some authors even claim that no unified account is possible. Note also that the assumptions about the placement of pitch accents and stress within focused constituents assure that the feature *F* is invariably realized in the surface form of the utterance by rhythmic and tonal prominence. The prosodic realization of focus is not universally assumed by those working on the semantics of focus. See Partee (1991) and Krifka (1992) for examples where foci crucially are NOT so realized. There are no abstract foci in the present analysis of English; for the time being, my critique of other approaches will have to remain implicit in the way the present approach is developed.

I want to bring special attention to (22d), the assumption that all pitch accents must be within focused constituents (cf. Selkirk's (1983:282), Focus Domination of Pitch Accent). It entails that if an utterance bears a single narrow (often called "contrastive") focus on some constituent x, the remainder of the utterance bears no intonational prominence, so that its contour sounds flat to the ear of the native speaker. Selkirk talks about pitch accent placement in terms of "old" and "new" information. Unaccented elements of an utterance (or at least NPs and other arguments which would otherwise normally bear accent) are taken to be "old information", accented constituents are taken to be "new information", but Selkirk doesn't make precise the sense she would give to those terms. Within the present account, we can offer a more precise sense for those terms -- they are taken to be part of the question under discussion.[19] I take the expression *old* to be synonymous with *given by the question under discussion*, and *new* (in the sense relevant here) to mean 'not given by the question under discussion'.

The focal alternatives for a given utterance are defined as follows:[20]

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[18]I must ignore the issue of the significance of multiple intonation phrases per utterance, and I will only briefly comment briefly on the significance of various combinations of phrase accent and boundary tone, though I feel certain that these matters warrant careful investigation. And there are a number of interesting questions about pitch accent placement within focused constituents (see Selkirk 1984), and about the choice of pitch accents (see Pierrehumbert & Hirschberg (1990)) which I must also ignore. Another issue that needs to be addressed in more detail is the question of where in the grammar (e.g., at what level of representation) these conventional elements should be encoded. Selkirk encodes them at SS ("surface structure") in a Government-and-Binding style grammar, both to capture the fact that the relationship between pitch accent placement and *F*-marking appears to be syntactically constrained and so that this information is available to both PF ("phonological form") and LF ("logical form"). I have not seen a careful exploration of these issues in a constraint-based grammatical framework.

[19]Selkirk points out that it appears that unaccented NPs sometimes occur even phrase-finally within a focused constituent, and still they seem to be old information in the sense intended here. This suggests to me that we may need to reconsider the phonological representation of focus in some respects, but I can't explore that in the present paper.

[20]Rooth (1985) and von Stechow (1989) don't define alternatives in this way. Instead, as in Krifka (1992), alternative sets are cancelled out when the constituent which determines them is argument to a focus-sensitive operator. That is not the case with the definition I offer here, and the difference should be borne in mind in comparing this account with those of Rooth, Krifka, or von Stechow. For simple cases, (24) yields the same results as the assumption that focused constituents are raised at Logical Form, and that such raising is island-insensitive (see Rooth (1995)). However, see Rochemont & Culicover (1990) for

12 BEST COPY AVAILABLE

(24) The **focus alternative set** corresponding to a constituent β, ||β||, is the set of all interpretations obtained by replacing all the F-marked (focused) constituents in β with variables, and then interpreting the result relative to each member of the set of all assignment functions which vary at most in the values they assign to those variables.[21]

Given (24), both questions and their answers, assertions, have corresponding alternative sets, the Q-alternatives of the questions, and the focal alternatives of their answers. This observation is the basis of von Stechow's (1989:36) notion of question/answer congruence, modified and generalized in (25):

(25) Move β is **congruent** to a question ?α iff its focal alternatives ||β|| are the Q-alternatives determined by ?α, i.e. iff ||β|| = Q-alt(α).
[after von Stechow (1989)]

Given (24) and (25), the assertion in (5b) is a congruent answer to the question in (5a):

(5) a. Who did Mary invite?
b. Mary invited nobody$_F$.

The set of focal alternatives for (5b) (with the empirically correct focus in this context) is the same as the Q-alternative set for (5a). Congruence doesn't require that the answer be among the corresponding set of alternatives (and in this respect is like the answerhood relation given in the previous section), but only that the answer and question evoke the same set of alternatives. Further, note that this theory of questions and answers gives a question like (5a) no existential presuppositions. The propositions in its Q-alternative set do all entail the existence of someone invited, but these propositions are just asked, not asserted; the question/answer relationship as defined above does not require that the answer be one of the Q-alternatives. They may all be false, as entailed by (5b), in which case there is no existential implication.

Consider the following presupposition of prosodic focus for assertions, generalized from the requirement for question/answer pairs in von Stechow (1989) and Rooth (1992):

(26) **Presupposition of prosodic focus in an assertion** β:
β is a congruent answer to the question under discussion at the time of its utterance.

Given (26), the prosodic focus on an assertion presupposes that the current goal of the discourse is to choose among the alternatives in ||β||.

This works fine for question/answer pairs like (5). But questions also bear prosodic focus, and we want a more general principle than (26), one which tells us the meaning of prosodic focus in an utterance of any mood. Recall that questions can be logically related to each other, and in effective strategies of inquiry they generally are. To motivate this

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arguments that association with focus is bounded, i.e. sensitive to islands; I don't yet see how to cope with the problem this raises in defining the focus alternative set, but it doesn't seem that, e.g., Rooth or von Stechow have taken this type of data into account either.

[21]We might want to require that the replacement variables be novel in the sense of Heim (1982), and constrain the set of assignment functions to include only those in the Satisfaction Set of the File/Context at the time of utterance of β. This would guarantee that any definite (or Familiar) NPs in β would be appropriately bound. But I won't pursue this refinement here.

on empirical grounds, consider the multiple *wh*-question (27a) and the simple *wh*-question (27b):

(27) a. Who invited who?
b. Who did Mary$_F$ invite?

Note that (27b) can be asked more or less immediately following (27a), so that <(27a),[(27b),∅]> seems to be a felicitous strategy of inquiry. It seems that the prosody in (27b) is crucial to this felicity, e.g., the same string but with focus on *invite* instead would be infelicitous. In order to capture this, we need to say something about the presuppositions of prosodic focus in questions.

It would be desirable to generalize over the presuppositions of prosodic focus for the two types of speech act considered, as in (28) below. Assume that each utterance has a logical form which involves a mood operator. $*\beta$ is a utterance of β with mood variable * ranging over {? (interrogative), . (assertional)}.

(28) **Presupposition of prosodic focus in an utterance** $*\beta$:
β is congruent to the question under discussion at the time of utterance.

(28) entails the subgeneralization in (26). However, given the definition of congruence in (25) and, especially, the definition of the focus alternative set in (24), (28) would fail to explain the felicity of <(27a),(27b)>, since in (27b) the *wh*-word, *who*, is not prosodically focused (compare the echo question *WHO did Mary invite?*, where *who* is plainly focused). However, the generalization will hold if we change (24) to obtain the set ranging not only over the F-marked constituents in β, but over any *wh*-elements as well. Then we would obtain (29):[22]

(29) **Focus alternative sets** (Revised definition)
The focus alternative set corresponding to a constituent β, $[\![\beta]\!]$, is the set of all interpretations obtained by replacing all the F-marked (focused) and *wh*-constituents in β with variables, and then interpreting the result relative to each member of the set of all assignment functions which vary at most in the values they assign to those variables.

Now we will apply the analysis in (25), (29) and (28) to the analysis of the sequence of utterances in (27). Given the semantics for questions in §1.2, the relevant interpretations are those in (27a') and (27b'):

(27a') $[\![$?Who invited who$]\!]$ = {u invited u' | u,u' ∈ D}

So if D = {Mary, Alice,Grace}, then the question will have the following q-alternative set (ignoring again the possibility of collective arguments):

{*Mary invited Alice*, *Mary invited Grace*, *Alice invited Grace*, *Alice invited Mary*, *Grace invited Mary*, *Grace invited Alice*}

(27b') (in the same model, given the derivation of this example in (61)
$[\![$?Who did Mary$_F$ invite$]\!]$ =
{*Mary invited Alice*, *Mary invited Grace*}

[22]This would not give the correct results for utterances containing indirect questions.

Clearly, the Q-alternative set of *Who did Mary*$_F$ *invite?* is a subset of that for *Who invited who?*. Hence, (27a) entails (27b), since a complete answer to (27a) will yield a valuation for all the alternatives in (27b) as well. (27b) is a sub-question of (27a), so that (27) represents a felicitous strategy of inquiry.

Calculating the focal presuppositions of (27b) as in (29), we find that ll(27b)ll = {u invited u' | u, u' ∈ D}. But this is just the set of propositions which is the Q-alternative set of (27a); i.e. ll(27b)ll = Q-alt(27a) = {u invited u' | u, u' ∈ D}. Hence (28) is satisfied.

Note that with broad focus on (27a), the question which it is congruent to is trivial: it is just the Big Question. However, I think this is misleading in this example: usually *invite* takes not only an agent and a patient, but also a goal, the event to which the patient is invited. Since no goal is given in (27a), it strikes me as elliptic, and this ellipsis suggests a connection between this question and an on-going prior discussion of some event. I won't go into this in any further detail here, but just want to note that ellipsis, like de-stressing/de-accenting within a focused constituent, may influence the determination of the question to which an utterance, either question or assertion, is presupposed to be congruent. See Rooth (1995) for discussion of the relationship between ellipsis and "anaphoric destressing".

(28) not only explains the felicity of the discourses in <(5a),(5b)> and <(27a),(27b)>, but also the infelicity of sequences like those in <(5a),(5c)> and <(5a),(5d)> and in <(27a),(27c)> and <(27a),(27d)>, since in none of the lat four cases will the focus alternative set of the second element equal the Q-alternative set of the first, the question under discussion:

(5) a. Who did Mary invite?
b. Mary invited nobody$_F$.
c. Mary invited$_F$ nobody.
d. Mary$_F$ invited nobody.

(27) a. Who invited who?
b. Who did Mary$_F$ invite?
c. Who did Mary invite$_F$?
d. Who$_F$ did Mary invite?

Note that on this conception of how prosodic focus works, it triggers a presupposition but does not uniquely determine the nature of the set of alternatives with which the utterance must be compatible/congruent, following Kadmon & Roberts (1986). Because of potential operator scope ambiguities, we also require, in many examples, fairly rich information about the structure of the preceding discourse in order to determine what the question under discussion actually is, and hence, indirectly, what the truth conditions of the utterance itself should be. Consider the example from Kadmon & Roberts, with the alternative scopes represented by the possible questions under discussion (QUDs) below it:[24]

(30) He doesn't like [MOST]$_F$ of the songs.
most ¬ : Q-alt(30) = {|DET songs (λx[¬ likes(he,x)])|: |DET| ∈ F}

[24]Kadmon & Roberts give an analysis of the full prosodic contour of the example, including the pitch accents, their placement, and the phrase and boundary tones; this is the same for each of the noted readings. They also give a detailed account of the kinds of context in which each of these readings can arise. The reader is referred to their paper for details.

¬ most : $Q\text{-alt}(30)_1 = \{[\neg \text{DET songs } (\lambda x\ [\text{likes(he x)}])]: [\text{DET}] \in F\}$
where DET is a variable of type <<e,t>,<<e,t>,t>>, and F is the set of determiner denotations.

These sets of alternatives correspond with different questions. For the *most* ¬ scope order, the question is, roughly, *What is the proportion of songs that he doesn't like?* ; for the ¬ *most* scope order, the question is *What is the proportion of songs that I deny that he likes?* The focus on the utterance makes it in principle congruent with either question, and so the utterance is ambiguous in its presupposition. The actual context of utterance will generally disambiguate. If it doesn't, i.e., a hearer encounters such an utterance without adequate context, then, as discussed by Kadmon & Roberts, the simplest context one can evoke will be the default assumption; here, this will be the non-denial context, in which *most* has wide scope. Setting up the other possible reading involves a more complex context, involving an assertion, its denial and a correction, so we are less likely to retrieve it when hearing the utterance out of the blue.

In summary, the prosodic focus on an utterance gives rise to the presupposition that the utterance, whether assertion or question, is congruent to the question under discussion. Such a mechanism will obviously help to give coherence to discourse, and assure relevance. And it is at least to some extent redundant. For example, in a question/assertion sequence, if the speakers are playing the language game correctly, i.e., *inter alia* observing Relevance and the imperative to address the goal represented by the question under discussion, then the assertion should be an answer to the preceding question. If the assertion's prosody also presupposes that it plays this role, this is a redundant confirmation of the assertion's role, and hence indirectly of the question being investigated. But of course, once the rules of a game are set, we often develop strategies for more efficient play. In the case of an assertion, if the prosody presupposes the type of question it addresses, then it may not be necessary to actually ask the question explicitly, especially if the relevance of the question to the ongoing strategy of inquiry is clear. Hence, hearers can use the presuppositions of English prosodic structure to accommodate portions of the information structure assumed by the speaker.

I will now turn to briefly review several types of examples from the literature on focus in light of this proposal.

§2.2 English Focus Phenomena

In §2.2.1, I will illustrate the application of the theory in §2.1 to one of the most discussed phenomena involving focus in English, association with focus. Then in §2.2.2 I will briefly consider extensions to deal with uses of focus often called *contrastive*, that in contrastive topics, contrastive focused pairs, and yes/no questions interpreted as alternatives.

§2.2.1 Association with Focus as a conversational implicature[24]

Some of the most interesting work in the formal literature on focus in the past decade is that which addresses what Jackendoff (1972) called *association with focus*, the tendancy for the interpretation of certain operators, including negation, *only*, *even*, modals, and adverbs of quantification, to depend partly on the prosodic focal structure of the utterance

[24]Thanks to Nirit Kadmon and Paul Portner, whose thoughtful comments on an earlier draft led to what is, I hope, a considerable improvement of this section. They should not, however, be taken to necessarily agree with the view proposed here.

in which they occur. Rooth (1985) argued that this sensitivity to focus is part of the lexical semantics of the operators he considered, and that it bears on the determination of their domain restriction. Basically, he argued that the domain is (a subset of) the focus-determined alternative set corresponding to the constituent which is the operator's scope at LF, this being specified as part of the lexical meaning of an operator like *only*. More recently, von Stechow (1989) and Krifka (1992, *inter alia*) have adopted a similar approach within the structured propositions framework. In their work, a structured meaning reflects the focal structure of the relevant utterance; it is an ordered pair, dividing the utterance's meaning into focus and ground. The lexical semantics of one of the focus-sensitive operators makes reference to both aspects of the structured meaning of the constituent which is its scope. Both of these approaches involving focus-sensitive operators place a heavy burden on focus in the architecture of the resulting semantic theory; association with focus is taken, by itself, to motivate a significant complication of the semantics for a language (see Rooth (1996) for some relevant discussion). Further, it is clear that focus doesn't fully determine the domain of these operators; other contextual factors plus presuppositions of the constituent in the operator's scope also play important roles in its determination (see Roberts 1991/1995). It would seem desirable to say something about the relationship between these various ways in which the domain is determined, but the focus-sensitive approach, being basically semantic, cannot generalize to include both the semantic focus-sensitivity and the clearly pragmatic factors. Simply making focus sensitivity part of the lexical semantics for the relevant operators fails to capture what it is that makes this phenomenon so pervasive in domain restriction. But it also seems plain that focus plays a regular and significant role in the interpretation of utterances containing these operators. We need to account for this role, something which, e.g., Vallduví (1992, 1993) and Vallduví & Zacharski (1994) cannot do in a systematic way.

Recently, Rooth (1992), von Fintel (1994,1995), and Schwarzschild (1994a,1994b) have attempted more pragmatic accounts of the various association with focus phenomena, accounts which are either anaphoric, as in Rooth and von Fintel's work, or involve entailments from principles for the interpretation of focus as contrast, as in Schwarzschild. The information structure framework presented here suggests another kind of pragmatic account for association with focus effects, one which follows straightforwardly from independently motivated principles defined in previous sections of this paper, without necessitating any additional stipulations. The account is like the earlier account in Rooth (1985) in assuming that association with focus is essentially a fact about how domain restriction of operators is influenced by prosodic focus. But I assume no special lexical sensitivity of the relevant operators; and unlike von Stechow and Krifka, I would argue that the focal structure of an utterance is transparently given by its prosodic structure, without the need to specify an independent partition on its meaning. In this section, I will outline how the information structure framework from §1 and the assumptions about prosodic focus in the previous section explain the role of prosodic focus in restricting the domain of *only*. See Calcagno (1996) for a related view of domain restriction in adverbs of quantification.

Utterance of a construction where *only* is a VP modifier, *x only VPs*, is often taken by theorists to presuppose that *x VPs*, but is sometimes assumed to only entail it. I will assume the presuppositional view, but this doesn't make a difference to the account I will offer. If *x VPs* is presupposed, then just as prosodic focus, in presupposing a question under discussion, can actually be used to introduce that question, so *only* can be used to introduce the presupposition that *x VPs*, even when it isn't already known to the interlocutors. The two cases are parallel in that the presupposition in each is quite explicit, so that it is clear what must be accommodated in order to repair the context. Unless they have grounds to object, cooperative interlocutors will accommodate these presuppositions as necessary.

Assume that the meaning of VP-adjunct *only* is as in (31):

(31) **Interpretation of VP-adjunct *only***:
Presupposed content: the subject has the property denoted by the VP
Proffered content: the subject has no properties apart from that denoted by the VP

Given this, the analysis of Association with Focus, following Rooth, involves determining which class of properties is the intended domain of quantification for the operator *no* in the proffered content of *only*. In Roberts (1991/1995) I argued that this couldn't be determined solely on the basis of an algorithm based on prosodic focus, but that it should be the set of properties which are *relevant* in the context at that point in the discourse. Now we can be more precise about what that means. The answer will be seen to follow from the requirement of Relevance as defined in (15) and the presupposition of prosodic focus in (28), both repeated here:

(15) A move m is **Relevant** to the question under discussion q, i.e. to $\lambda w \lambda p[QUD(p)(w)]$, iff m either introduces a partial answer to q (m is an assertion) or is part of a strategy to answer q (m is a question).

(25) Move β is **congruent** to a question $?\alpha$ iff its focal alternatives $\|\beta\|$ are the Q-alternatives determined by $?\alpha$, i.e. iff $\|\beta\| = Q\text{-alt}(\alpha)$.

(28) **Presupposition of prosodic focus in an utterance** $^*\beta$:
β is congruent to the question under discussion at the time of utterance.

To see how this domain restriction works, consider the example in (32):

(32) Mary only invited [LYN]$_F$ for dinner.

Given (28), (32) presupposes the question in (33):

(33) Which individual(s) is/are such that Mary has no properties apart from having invited that/those individual(s) for dinner?

In order to understand what a speaker intends by uttering (32), we must determine the intended domain for *only*. We already know that there is an independent requirement that the utterance, and the question it presupposes, be Relevant to the prior context, i.e. that they address the question under discussion. If (32) is uttered out of the blue, this would mean that the presupposed question (33) would have to form part of a strategy to answer the Big Question, all of Mary's properties would be Relevant in such a case, as any information about her having or not having them would address the Big Question. But, under the assumption that Mary exists, utterance of (32) out of the blue would make it false in any reasonable model, since Mary surely has, at the very least, the property of self-identity (and presumably a number of others), as well as perhaps that of having invited Lyn for dinner. Hence, on the assumption that the speaker of (32) is competent and is observing the Gricean maxim of Quality, i.e. trying to assert something truthful, this can't be the intended context of utterance for (32). As I have argued elsewhere (Roberts 1991/1995, 1995b), domain restriction is always constrained by cooperativity: the cooperative hearer assumes that the speaker is cooperative as well (and competent), and on this basis, seeks to resolve any apparent failure of cooperativity, e.g. failure to satisfy the Gricean maxims of Quality or Relevance, presupposition failure, etc., by restricting the domain in such a way as to make the contribution cooperative after all.

Now imagine instead that (32) is uttered following (34):

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(34) Who did Mary invite for dinner?
(32) Mary only invited [LYN]$_F$ for dinner.

Of course, as we have already seen, (32) prosodically presupposes that the question under discussion is (33), which is not the same question as the explicit (34). We can only felicitously accommodate the presupposed (33) if the newly accommodated question is itself Relevant to the accepted question (34), so that they form a felicitous Strategy of Inquiry and hence the resulting Information Structure is well-formed. This requirement is straightforwardly met just in case we assume that the intended domain of *only* is (a possibly non-proper subset of) the set of properties which Rooth's (1985)/von Stechow's/Krifka's theories would fix conventionally as the domain of *only* in (32). This is because, given the semantics of questions, only with this domain restriction will all of the answers to (33) be answers to (34) as well, so that (33) is Relevant to (34). Here's why:

The only way to address (34) is to determine the truth of a proposition of the form *\[n invited* α*\]*, where α is either a rigid designator denoting an individual in the model or else *nobody*.[25] But then this means that the set of Relevant properties is just the set which, when predicated of Mary, yields one of those propositions, i.e. a property of the form *\[invited* α*\]*, where α is either a rigid designator denoting an individual in the model or else *nobody*. This set of properties is then the set which must restrict the domain of *only* in (33) if it is to be Relevant to (34), i.e., to form part of a strategy of inquiry for addressing (34). But this is just the set of alternative properties which is retrieved in other accounts, e.g. in Rooth (1985) via the calculation of the p-set of the VP in (32). In those accounts, that p-set is referred to by the lexical semantics of *only*. But on the present account, this isn't necessary.

When we take the domain of *only* (the set of relevant properties) in (32) to be the set of properties of inviting someone or other to dinner, then (33) is logically equivalent to (35):

(35) Which individual(s) x is/are such that of all the properties of inviting someone or other for dinner, Mary has none apart from having invited x for dinner?
=
Which individual(s) is/are such that Mary invited no one else for dinner?

(34) and (35) are very close in meaning, though they are not identical: Their q-alternative sets are distinct. The difference is also reflected in the fact that all of the direct answers to (35) are complete, each of them also a complete answer to (34); if we answer (35) with *Alice and Gertrude*, then this entails that no one else was invited, including Grace. But (34) has partial direct answers which are not complete, so that we can answer it with *Alice and Gertrude* without precluding Mary's also having invited Grace. However, though these two utterances don't denote the same question, in any given model all the complete answers to (35) are complete answers to (34) and *vice versa*, so that they logically entail each other in the sense defined by Groenendijk & Stokhof.[26] Because

[25]Again, I'm ignoring the possibility that Mary invited more than one individual, which would make relevant as partial answers propositions like *\[Mary invited few of the students\]*. This is merely in the interest of simplicity, and is inessential to the argument I give.

[26]Recall that questions and answers are semantic entities, not to be confused with the utterances which denote them. If the complete answer to (34) is that suggested by replying *noone*, this entails that the answer to (35) must be that denoted by the reply *everyone* if there are people in the model, or by *nobody* if there are no people, the converse entailments hold, as well. The complete answer to (34) denoted by *everyone* is similarly correlated with the complete answer to (35) given by replying *all the people*. In the less extreme cases, complete answers to the two questions could be expressed identically, so that answering

they have the same set of complete answers, (35) and (34) would establish the same partition on the context set at a given time of utterance. So with the domain fixed as in (35), the presupposed question (33) is Relevant to (34), in the technical sense defined in (15). But then in order to be Relevant to (33)/(35), and hence indirectly to (34), the domain of *only* in (32) must be set in the same fashion.

As Paul Portner pointed out (p.c.), this won't guarantee that the domain isn't a proper subset of Rooth's properties. But, of course, Rooth also admitted the possibility of additional, contextually given restrictions on the domain of *only*, as given by his conventional calculation of p-sets and focus-sensitive lexical semantics for *only*. This can be motivated for discourses such as ≈⟨(34),(32)⟩. Consider a scenario where the interlocutors already know that Mary invited a visiting colleague to dinner and wanted to get someone else in her department to accompany them. Then the alternative set of properties should involve all the other people in her department, including Lyn, but not the visitor. Then utterance of (32) in that context would not entail that Mary invited no one else in the world except Lyn to dinner, and would be consistent with the speaker being invited as well.

But what other kinds of questions might (32) Relevantly address? It turns out that this class is quite restricted and depends in part on context. The prosodically presupposed question (33) sets up a partition on the context set; the cells, possible complete answers to the question, differ from each other in the identity of the sole invitee. Besides the relevant properties considered above, corresponding to Rooth's p-set for the VP, any other properties that Mary might have are one of two types, which I will call the *contextually entailed restrictions* and the *logically independent properties*. The entailed restrictions are entailed by the context set, because they are known by the interlocutors to be Mary's properties; these include the property of inviting the visitor in the described context. Entailed restrictions serve to implicitly restrict the domain of *only* in a negative fashion, because there is no world in the context set in which Mary does not have all these properties; so we have the implicit commitative restriction *with the visitor* on the VPs in (32) in the situation described. But an entailed restriction is never Relevant because it doesn't distinguish between cells in the partition established by (34).

The other type of non-p-set properties are those which so far as the interlocutors know may or may not hold of Mary, and hence are in principle completely independent of the question under discussion. For example, if (32) is uttered following a question like *Did Mary brush her teeth this morning?*, it will be #Relevant to that question in most contexts. That having dinner with someone is not usually Relevant to the question of whether she brushed her teeth is reflected in the fact that in any reasonably realistic model, the question of whether Mary has the logically independent tooth-brushing property establishes a distinct partition from that established by (34). Questions based on such independent properties do not bear on the choice of a (partial) answer to the question under discussion (33) because they cross-cut the cells in the partition it has established; determining that Mary has one of them will hence not lead to removal of a cell from the partition. The discourse would fail on those grounds alone, never mind that the domain of *only* in such a context would be as in the case of utterance out of the blue. But now suppose that the context entails that Mary was going to have dinner with one or more of her friends. Further, assume that Mary's friend Lyn is also her dentist and always nags her to watch her dental hygiene, but only when the two are alone. Finally, suppose that Lyn's reminders to Mary are generally effective so that if, out of the group of her friends, Mary only dined with Lyn, then (Lyn having nagged her) she would remember to brush her teeth the next morning. In such a case, the question presupposed by (32), (33), under the entailed restriction that the only people she was considering dining with were

(34) by *Alice, Gertrude and Grace* would entail and be entailed by the answer denoted by the same reply to (33), and so forth.

the aforementioned group of friends, WOULD be part of a reasonable strategy to answer the question of whether she brushed her teeth, for (32) would contextually entail the answer to that question. Relevance is essentially context-dependent. But still, (32) could only entail the answer to *Did Mary brush her teeth?* on the assumption that the correct domain, i.e. the contextually salient group of her friends, was chosen to restrict the interpretation of *no* in the interpretation of *only*. So the logically independent properties may sometimes be Relevant, but this is entirely dependent on context.

Rooth's (1985) theory of association with focus, and the subsequent theories of von Stechow (1989) and Krifka (1992) stipulated, as part of the lexical meaning of *only*, that its domain should be calculated directly on the basis of the prosodic focus in its scope. There is a type of context in which such theories systematically make the wrong predictions, as has been pointed out by Vallduví (1992), Roberts (1991/1995), and Partee (1991). In the present theory, I take their examples to illustrate how prosody, though it makes a regular, conventional (because presuppositional) contribution to the determination of intended context, and hence of intended domain restriction, cannot by itself give the intended domain restriction for *only*. Nirit Kadmon (p.c.) offers the following illustration of this for the example in (32). Suppose we are talking about some things that we had been afraid that Mary was going to do today that we disapprove of. These included Mary's having the properties listed in (36):

(36) inviting Lyn for dinner
inviting Bill for dinner
staining the tablecloth at lunch
smoking before dinner

In this context, consider (37):

(37) A: Mary wasn't so bad after all. Of all the things we were afraid she might do, she only [invited Bill for dinner]$_F$.
B: You got the person wrong. She only invited [Lyn]$_F$ for dinner. But it's true that she did only one of those terrible things she could have done.

In this case, we want the domain of *only* to be the set of properties in (36), and not the set of properties of inviting someone or other for dinner, which latter would be the set given compositionally by, e.g., Rooth (1985). Conventionally fixing the domain yields the wrong truth conditions.

Here is how we can account for such examples in the framework of Information Structure, given the presupposition of prosodic focus in (28). In (37), A presupposes the question (38):

(38) Which property is such that out of all of the properties in (36), Mary had no other properties apart from that.

The domain restriction for *only* is explicit, and refers to the principal question under discussion, i.e. which of the properties in (36) Mary has. Then A asserts that Mary has the property of being such that out of all of the Relevant properties in (36) she only has the property of having invited Bill for dinner. The question presupposed by the second sentence in (37B) is (33), just as it was for (32). But here the Relevant properties will be different, since the context to which B's utterance must be Relevant is different. B makes it explicit that (s)he is offering a correction to A; even if (s)he hadn't, in order to explain the Relevance of B to (38), the question addressed by the immediately preceding utterance A, especially given their parallel forms but contrasting prosodic focus, we would assume that B is offering a correction of the assertion made by A. As in corrections generally, the corrector B addresses a different question than that addressed

by the corrected interlocutor A, as we see by the distinct prosodic pattern employed in A; but still the correcting utterance B, by virtue of what it is to correct, gives *de facto* a distinct alternative answer to the question addressed by the corrected A. The questions addressed by corrective utterances are meta-questions. Here, (33) is logically equivalent to:

(39) Which individual(s) is/are such that of all of the properties in (36), Mary has none apart from having invited that/those individual(s) for dinner?

Of course, this is not the same question as (35). The correcting B asserts that it is Lyn who is the individual such that of all the Relevant properties in (36), Mary only has the property of inviting that person for dinner. This is the correct interpretation, and in fact also gives a complete answer to the question A addressed, (38), so that it is also contextually Relevant.

For similar examples, Partee claimed that there were embedded foci with no prosodic reflexes; the present account seems to improve on hers by avoiding the assumption of abstract foci, with no surface reflexes. Vallduvi took similar examples to discredit Rooth's general approach, but offered no general explanation for the Association with Focus effects. In the present framework, the contribution of focus IS conventional, albeit presuppositional instead of being proffered as in Rooth, and so we can both account for the classic examples of Association with Focus and allow for examples like (37).

Another of the virtues of the present account that it can explain association with focus effects in questions, as well as in assertions. So consider (40) and (41):

(40) Did Mary only invite [Lyn]$_F$?
(41) [Did Mary only invite Lyn]$_F$?

By (28), (40) is presupposed to address the question (42):

(42) Who did Mary only invite?

What (42) means can only be given in view of the context of utterance for (40), i.e. the QUD stack and the strategy which it (partially) embodies. One possibility is that it is the same as the question (35) discussed above. In that case, in order to be Relevant, and hence address (42)/(35), (40) must be part of a strategy to answer (35). But we have seen that (35) establishes a partition in which only certain of Mary's properties are Relevant. In order to form part of a strategy to address (35), answering (40) must entail at least a partial answer to (35), and hence pertain to which of the Relevant properties Mary has. This yields the correct domain restriction on *only* in (40), as it did for (32). (41) has broad focus, and so presupposes only the Big Question, which its own answer, of course, will be part of a strategy to answer. But the Big Question doesn't give us any clues about the domain restriction of *only*. Here, only additional contextual factors can help, which seems appropriate. As we saw in the previous example, prosodic focus doesn't always give the intended domain restriction for the relevant operators.

Finally, notice that on this account the selection of the intended domain of *only* turns out to be purely pragmatic, a conversational implicature: only if the correct domain is assumed will the utterance be Relevant. Assuming that the speaker is cooperative, then, we must assume that that domain is intended. It might be objected that this type of approach to the problem is too weak to account for the robust facts about association with focus. What, for example, of implicature cancellation? Wouldn't this implicative account predict that association with focus is cancellable? Though I cannot go into this in detail here, let me briefly rebutt this objection. Following Welker (1994), I believe that implicature cancellation is generally misunderstood. Given a particular context,

conversational implicature cancellation is no more possible than the cancellation of conventional implicatures, i.e. presuppositions. What happens in the classic cases of so-called implicature cancellation (see, e.g., the papers on implicature in Grice (1989) or chapter 3 of Levinson (1983)) is that the speaker clarifies the intended context for the utterance, and often, in particular, corrects a misapprehension of the question(s) being addressed and/or their role in the strategy of inquiry. So "implicature cancellation" might more aptly be called "*post hoc* clarification (by the speaker) and revision (by the hearer) of intended context". Sometimes this is necessitated by breeches of conversational competence, while in other cases the speaker may actually set up the implicature on purpose, hastening to pretend it was not intended after the fact to avoid taking responsibility for it (a conversational implicature parallel with the gossip case in presuppositions). In the present framework, cancellation is not an issue. The theory of Information Structure makes it very precise both what a "context" of utterance is and what is required for an utterance to be Relevant in that context, so that the predictions are straightforward and unambiguous. "Cancellation" is a species of miscommunication, extra-theoretical.

This illustrates the methodological advantages offered by the type of framework for pragmatic analysis proposed here. Though it is common to talk about the context of utterance of a given example, this framework, and the prosodic presupposition of congruence to a question in particular, force us to look at concrete facets of the utterance's context and predict how they directly influence its interpretation. If we assume something like InfoStr, in which the roles and relations between questions and answers are well-defined, then determining the question under discussion gives us information about what is Relevant, puts constraints on logical aspects of interpretation like domain restriction, and hence begins to illuminate the hitherto rather mysterious way in which context influences interpretation. This permits us to make falsifiable predictions about these pragmatic aspects of interpretation (cf. also Kadmon & Roberts 1986), legitimating the use of pragmatic explanations as alternatives to the elaboration of the semantic architecture of our theories. For Association with Focus, the domain of operators like *only* is pragmatically given, assuming only the independently motivated principles in (15), (25) and (28). No additional stipulations about lexical semantics need be made, structured propositions are not required, and no special anaphoric elements associated with focus need be assumed to annotate S-structures. Insofar as Information Structure is independently motivated, as a general framework for pragmatic explanation, the account carries no additional cost at all.

§2.2.2 Contrast and Alternatives

§2.2.2.1 Focal Presuppositions in Utterances with Contrastive Topics

Jackendoff (1972) discussed an interesting phenomenon wherein multiple foci in a single utterance may bear two distinct intonation contours, which he called the *A* and *B* (*contours*. In terms of the analysis of contours of the sort developed by Pierrehumbert and her associates, each of Jackendoff's contours appears to involve an entire intonation phrase, with a L+H* pitch accent on the focused sub-constituent,[27] a L- phrase accent, and distinct boundary tones: L for A contours, H for B contours. (Native speakers, at least, should be able to reconstruct what this sounds like on the basis of the question-answer pairings below, and their consequences for prosody in the answer.) Jackendoff called the focused constituent in the B-contoured phrase the *independent focus*, that in the A-contoured phrase the *dependent focus*, and showed how the use of these accents correlates with certain question/answer pairings. In addition, the B contour is not

[27]Sometimes this sounds to me like a simple H* pitch accent, but I follow Pierrehumbert & Hirschberg (1990) in assuming L+H*.

generally used alone, but assumes the existence of an A contour as well. For example, consider Jackendoff's (43a) and (43b):

(43) a. $[\text{John}]_B$ ate $[\text{beans}]_A$
b. $[\text{John}]_A$ ate $[\text{beans}]_B$

Along the lines of the analysis of similar examples in Pierrehumbert & Hirschberg (1990), these examples would be represented as in (44):

(44) a. $[\text{John}_F]_{L\,H}$ $[\text{ate beans}_F]_{L\,L}$
b. $[\text{John}_F]_{L\,L}$ $[\text{ate beans}_F]_{L\,H}$

Each of these has two intonation phrases, the bracketed constituents annotated with phrase accent/boundary tone sequences, each of which contains a focused constituent (cf. the principles of the Phonology of Focus in (22)). In what follows I will sometimes use the "A" and "B" accent notations for simplicity, but I assume that something like (44) is the more accurate transcription.

Jackendoff pointed out that (43a) would answer a question like *What about John? what did he eat?*, whereas (43b) would answer a question like *What about beans? who ate them?*. But the question/answer pairings couldn't be switched -- (43a) couldn't answer *What about beans? who ate them?*. I would propose the following account of these contours and their distribution within the present framework; the account is based on unpublished joint work with Nirit Kadmon (who might not, however, subscribe to the present framework within which it is developed).

Ignoring intonation phrasing, both (43a) and (b) should presuppose that the question under discussion is:

(45) $\{u \text{ ate } u' : u,u' \in D\}$, i.e. *Who ate what?*

However, intuitively they aren't direct answers to (45), but respond instead to the distinct sub-questions (46a) and (46b):

(45) Who ate what?
(46) a. What did $[\text{John}]_F$ eat? [cf. *What about John? what did he eat?*]
(46) b. Who ate $[\text{beans}]_F$? [cf. *What about beans? who ate them?*]

The fact that (43a) and (b) presuppose (45), as well as one of the sub-questions in (46a) or (46b), is related to what's going on in the following type of dialogue:

(47) (No prior discourse, at least on a related subject)
A: [When are you going to China]$_F$?
B: Well, I'm going to $[\text{China}]_B$ in $[\text{April}]_A$.

(47B) answers the question in (47A), but it does more than that. Its prosodic focal structure presupposes that the question under discussion isn't (47A), but the super-question in (48):

(48) 'When are you going to which place?', i.e. {you are going to u at t : u a place, t a time}

It is generally assumed that alternative sets, like operator's domains, are non-singleton, non-empty. This question, then, implicates that there is more than one place that B is

planning to visit. Of course, in this context, the super-question hasn't already been accepted by A. But A is likely to accommodate it, out of curiosity, and ask (49):

(49) Oh? Where else are you going, and when?

i.e. ask for the rest of the information which would complete B's answer to the presupposed super-question. In this case, the overall strategy of inquiry is <(48),{<(47A),ø>,<(49),ø>}>, wherein the superquestion (48) has been accommodated.

Similarly, the B accents in (43) tell us that the super-question (45) is under discussion and that there is also under discussion a sub-question of one of the forms in (46a) or (46b); and further that (43a) could only answer (46a), while (43b) could only answer (46b). We might say that (43a) presupposes the strategy of inquiry <(45),{<(46a),ø>}>, while (43b) presupposes the strategy <(45),{<(46b),ø>}>. (43a) is an infelicitous move in response to the strategy <(45),{<(46b),ø>}>, while (43b) is infelicitous in response to <(45),{<(46a),ø>}>. Of course, the sub-questions don't have to be explicitly asked, any more than (45) does, but that isn't an issue, given the semantic character of the presupposed questions in this theory and the abstract nature of the information structure of discourse. The goals and assumptions presupposed by the examples in (43) appear to be correctly captured by these correlated strategies.

In order to capture these facts, I assume that both A and B accented noun phrases are foci, so that the question in (45) is presupposed; this will follow from the F-marking on the utterances in (43).[28] Then how is the assumption of the immediate sub-questions in (45) triggered? The crucial difference between the two accents in such examples appears to be the boundary tone, H (or the sequence L-H, should it turn out that in general that phrase+boundary tones form a morphological unit). The (L-)H accent on the B-contoured intonation phrase marks its focused constituent as the independent argument to the abstract corresponding to (45), i.e. the one chosen first, whose choice then determines, or at least narrows, the choice of an alternative from the set corresponding to the other, A focus (hence, Jackendoff's term *dependent focus*). (L-)H means "answer still in progress -- another focus to fill", which explains why it cannot occur by itself (but can iterate, so long as there's an A focus around somewhere). If you choose this independent argument from one of the alternative sets associated with the question in (45), then the presupposed question under discussion will be either (50a) or (50b), i.e.:

(50) a. {u likes u': u, u' ∈ D & u = John}.
b. {u likes u': u, u' ∈ D & u' = beans}.

But (50a) is equivalent to (51a), which is the interpretation of (45a), and (50b) is equivalent to (51b), which is the interpretation of (45b):

(51) a. {j likes u': u' ∈ D, j = *John*}.
b. {u likes beans: u ∈ D}.

So, (43a) and (43b) both presuppose (45) by virtue of identical placement of prosodic focus. But the location of a L-H boundary sequence indicates a sequence of selection from the contrast sets for the foci, and hence presupposes a sub-question to the prosodically presupposed question. Because this boundary sequence is located differently in (43a) and (43b), they presuppose distinct sub-questions. The fact that for (43a), the presupposed questions (45) and (46a) form a question/sub-question strategy,

[28]Vallduví doesn't assume that contrastive topics, among which I take him to include B-accented elements in examples like Jackendoff's, are foci. But so far as I can see, this leaves him without an explanation for facts of the sort discussed here.

means that (43a) itself presupposes such a strategy; similarly for (43b) and the strategy <(45),[<(46b),ω>]>. Hence, on this account utterances which contain both independent and dependent foci presuppose not just a question under discussion, but a possibly complex strategy of questions.

We would of course need to look at more data on the occurrence of the L-H boundary sequence to see if this is a plausible account for its effects across the board. Hence at present, this can only be a provisional proposal for the treatment of examples like those in (43). But note that the boundary tone sequence on B-accented phrases isn't that of question intonation, which involves a H-H phrase+boundary tone sequence. In the other types of examples involving L-H which I've reviewed informally, its proposed contribution to meaning is at least consistent with its apparent role here.

Note that in these accommodationally enriched discourses, e.g. <(45), (46a), (43a)>, the answer, here (43a), is congruent to both the immediate question under discussion, (46a), and the super-question, (45). But this does not by itself tell us that the entire strategy <(45),[<(46a),ω>]> is presupposed. Presumably, the latter fact should follow from presuppositions associated with the choice of the B accent. This illustrates how the presupposition of focus formulated in (28)

(28) **Presupposition of prosodic focus in an utterance *β**:

β is congruent to the question under discussion at the time of utterance.

while necessary, is not yet sufficient to capture all the presuppositions of the prosodic structure of an English sentence. To give a fully adequate account, we would need to look not only at the selection of focused constituents, but also at both the intonation phrasing and the types of phrase accents and boundary tones associated with the chosen intonation phrases (and most likely at the particular pitch accents chosen, as well). The complexity and richness of prosodic structure is too often overlooked in semantic/pragmatic studies of focus, and this sometimes leads to crucial mis-analyses of certain types of examples. We will see one of these in the following section.

§2.2.2.2. Contrastive Focus within an Utterance

There a a number of types of examples of what has often been called *contrastive focus* which seem to follow fairly straightforwardly from the framework and principles proposed here. I'll consider first examples that involve inter-sentential (or inter-clausal) examples like that in (52):[29]

(52) Mary called Sue a Republican, and then [SHE]$_B$ insulted [HER]$_A$.

Note that there is a B accent on *she* in the second clause.

It does not suffice to explain the intended interpretation of the second clause in (52) to simply say that it offers an answer to (53):

(53) Who insulted who?

This is because (52) seems to have two additional presuppositions:

(54) (i) the first clause also reports an insult, and

[29]It has been suggested to me that this type of example was first noticed by George Lakoff, but I don't know where. I'd appreciate any references that readers might point me to.

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(ii) the insulter and insultee roles are reversed in the second clause relative to the first.

However, I will argue that these presuppositions follow fairly straightforwardly from the view of prosodic focus sketched earlier in this section, so that this type of example doesn't motivate any extra principles pertaining to the interpretation of specifically contrastive focus.

First, notice that in uttering (52) *insulted* is "deaccented" (see Ladd 1980). Selkirk (1983) objects to the term *deaccenting* for the prosodic phenomenon in question, as it suggests that the constituent in question was initially accented and then lost its accent. Especially when the constituent is a verb, it's not clear that it would "normally" be prosodically prominent, let alone receive nuclear stress. But in (52) *insulted* receives a rendering which is noticeably flat when compared to its realization in the utterance of *Mary insulted Sue* after *What happened next?*, or even in the second clause of (52) when the implicature that being called a Republican is insulting is not intended. This type of deaccenting presupposes that the insult relation is already under discussion, as would be the case if (53) is the question under discussion. I would maintain that a conjoined structure is generally offered as a complex (partial) answer to a single question; this would follow from the theory of information structure in §1, in particular from the requirement that any given move be Relevant, and hence address the question under discussion.[30] The destressing on *insulted* in the second conjunct of (52) presupposes that the question is (53). If the first conjunct is then to be part of the answer to this question, it must report an insult as well, yielding the implication in (54ii).

(54ii) arises because the only way that both (54i) can hold and the pronouns take *Mary* and *Sue* as their antecedents and yet the second clause still be informative, is for the insulter/insultee roles to be reversed. The B accent on *She* tells us that not only does the clause address (53), but also a sub-question, one of the two questions which would result if we replace *She* by one of the salient women in the context, yielding either*Who (of Mary and Sue) did Mary insult?* or *Who (of Mary and Sue) did Sue insult?*. But the first conjunct has already told us that Mary insulted Sue, so the only sub-question which can be non-redundantly addressed by *she insulted her* is the second, i.e. *Who (of Mary and Sue) did Sue insult?*. Then the nonreflexive pronominal object must denote Mary, and not Sue.[31] Hence, the presupposed question is contextually restricted in such a way as to presuppose the reversal of roles in the answer. No special stipulations about contrast between pairs of NPs is required.

A similar story can be told about examples like Schwarzschild's (1994) (55):

(55) a. John was a victim of suicide(, but)
b. THE MOB killed SAM.

The deaccenting of the verb in (55b) presupposes that it's part of the question under discussion. Whether it's conjoined with (55a) or simply follows it, the content of the two utterances plus the prosody in (55b) will suggest that both are partial answers to the same question, i.e. *Who killed who?*. Notice the difference between the deaccented predicate in (55b) and the realization of the predicate in (55c):

c. The mob poisoned Sam.

[30]Of course, much more needs to be said to support this claim, but here it would take me too far afield. This is ultimately a question about the rhetorical roles played by complex clausal structures. See §3 for suggestions about how the theory of information structure may relate to rhetoric.

[31]We could replace the second conjunct by *and then SHE insulted HERSELF*, so that Sue insults Sue, with the same implicature that calling someone a Republican is insulting.

For me, when (55c) follows (55a), *mob*, *Sam*, and *poisoned* are all accented. I believe that the NPs both have B accents, the verb an A accent, suggesting that the question under discussion is *How was who killed by whom?* The difference between <(55a),(55b)> and <(55a),(55c)> seems to be that John's having committed suicide in (55a) entails his having been killed, albeit by himself, whereas it doesn't entail his having been poisoned. Hence, the killing in (55b) is 'old' information, whereas the poisoning in (55c) is not.

The principle which Schwarzschild offers to account for such examples follows from the theory offered here:

(56) Contrast constraint (Schwarzschild 1993a)
If B is uttered in contrast with A, then
i. A is not identical in meaning to B,
ii. the meaning of A can be gotten by replacing focussed elements of B with elements of the same semantic type, and computing the meaning of the resulting expression.

However, this principle can be shown to follow from the present account plus general Gricean principles. The non-identity in meaning, (56i), follows from Grice's Quantity I maxim, requiring that one be (as) informative (as possible), and the replacement clause (56ii) from the assumption that both the clauses in these examples address the same question, plus congruence.

But there is a type of example involving intraclausal contrast which poses *prima facie* problems for the account proposed here. Consider the following example from Rooth (1992):

(57) An [American]$_F$ farmer was talking to a [Canadian]$_F$ farmer.

As transcribed by Rooth, (57) is predicted by my account to presuppose a question under discussion like (58a) or (b):

(58) a. What kind of farmer was talking to what kind of farmer?
b. What kinds of farmers were talking (to each other)?

But somehow this doesn't seem quite right; those native English-speaking linguists with whom I've discussed this generally seem to agree that (59) may be felicitously uttered out of the blue:

(59) An AMERICAN farmer was talking to a CANADIAN farmer.

(59) is a fairly crude impressionistic transcription, which only notes the primary accented elements in the utterance. If Rooth has correctly analyzed (59) as (57), then the theory of prosodic focus proposed in this paper makes an incorrect prediction, as well as offering no account of the contrast in (59). Since the contrast is intra-clausal, we cannot address the contrast by claiming that the contrasted constituents suggest alternative (partial) answers to a single question under discussion.

However, there is reason to question whether (57) is the correct analysis of the impressionistically transcribed (59). Recall the phonological principle (22d), repeated here:

(22) The Phonology of Focus:
- (a) There is at least one intonation phrase per sentential (or sentential-fragment) utterance.
- (b) There is at least one focused sub-constituent (possibly non-proper) per intonation phrase. This **focused constituent** is marked with the feature *F* in what follows.
- (c) There is at least one pitch accent per focused constituent, associated with a subconstituent.
- (d) Every pitch accent must be associated with material in a focused constituent.
- (e) There is one phrase accent (H- or L-) and one boundary tone (H or L) per intonation phrase.
- (f) The string-final pitch accent in the focused constituent is assigned the most prominent stress in the intonation phrase (Nuclear Stress Rule).

This predicts that all the material in (57)/(59) except the two adjectives should be deaccented. However, this is only a felicitous prosodic contour for (59) when it is in fact the answer to one of the questions in (58), and not when it is uttered out of the blue. In the latter, out of the blue type of context, both the first noun *farmer* and the verb *talking* are accented, although they do not bear nuclear stress; they do not have the flat, deaccented contour. But how can we reflect the sense that *American* and *Canadian* are the primarily contrasted elements of (59) while avoiding the transcription in (57), and hence incorrectly predicting a lack of pitch accents on other elements of the utterance? One possibility is reflected in (60) below. In it, intermediate intonational phrases (see Beckman & Pierrehumbert (1986)) are marked with '-', full intonation phrases with '%' as is standard in the ToBI transcription system for English (see Beckman & Ayers 1994), starred tones are pitch accents (aligned with syntactic constituents), T- (where *T* is either a high or a low tone) is a phrase marker (aligned with an intermediate phrase), and T is a boundary tone (aligned with a full intonational phrase):

(60) [[An AMERICAN]$_F$ [farmer]$_F$] [[was talking]$_F$ [to a CANADIAN farmer]$_F$.]
H* L- H* L-L H* L- H* L-L

The existence of two full intonational phrases is indicated by a slight pause and lengthening at the end of the first, after *farmer*, as well as the falling phrase accent and boundary tone. In addition, each full intonation phrase involves two intermediate phrases, with intermediate phrase boundaries between *AMERICAN* and *farmer* and again between *talking* and *to*. In this structure, we might claim that the each of the intermediate phrases is focused (i.e., each has maximally broad focus). This is consistent with the pitch accent placement, which in the first three intermediate phrases falls on the final element, i.e. on *American*, *farmer*, and *talking*. Consistent with the informants' realization of (59), and unlike the realization of Rooth's (57), the only deaccented element in the string is the second token of *farmer*. This lack of accent may be accounted for by the anaphoric deaccenting argued for in detail by Ladd (1980) and Selkirk (1983), with the antecedent in (59)/(60) being the first token of the noun; hence, the deaccented final element is still consistent with assuming that the final intermediate intonation phrase has broadest focus.

(60) would be congruent with the question:

(61) Who was doing what?

Unlike the questions in (58), (61) is compatible with the intuition that (59) may be uttered out of the blue, if we take the latter to mean that the utterance addresses a very general question.

But even if this is correct, what can we say about the placement of primary stress on the adjectives? That does plainly seem to be motivated by the intended contrast between their values. David Dowty (p.c.) pointed out a related type of example, inspired by earlier examples due to Horn (1985, 1989):[12]

(62) A PROactive farmer was talking to a REactive farmer.

(62) may also be uttered more or less out of the blue; the prosodic facts in such an utterance – lack of deaccenting on the first adjective stem, noun and verb – parallel those for (59). This suggests that the focal structure of (62) is more like that in (60) than that in (57). In fact, it doesn't seem that this type of example can be understood to involve narrow focus on the contrasted prefixes, insofar as focus is taken to correlate with syntactic constituents. What kind of question under discussion could such narrow focus indicate? *What kind of -active farmer was talking to what kind of -active farmer?*. Since the prefix *re-* in *reactive* isn't productive in contemporary English, such a narrow focus would be not only sub-lexical, but sub-morphological, and this is surely related to the infelicity of such a question. Several other pairs of adjectives would work in the same way, such as *UNinterested* and *DISinterested*, so the phenomenon is fairly general.

It seems that in examples like (62), as in (59) under the analysis in (60), a contrast is superimposed on an otherwise broadly focused prosodic structure. With respect to (60), note that, whatever physical measure(s) actually correlate with perceived relative stress, none of the principles for the phonology of English prosody in (22) bear on the comparative value of multiple intonation phrases or intermediate intonation phrases with respect to these measures. In fact, of course, we know that final phrases are not always stronger in this respect that those earlier in an utterance; witness the *sotto* voice often used for intraclausal parenthetical elements or asides. Hence, what I take (60) to suggest is that there is a mechanism for determining relative weight of multiple intermediate phrases which goes beyond the rules for intonation phrasing and placement of accent and focus, as given in (22).

Of course, determining whether (60) is, in fact, the correct analysis of the out of the blue utterance of (59) would require phonetic analysis which I am not prepared to undertake. I do think it obvious that (57) is *not* the correct analysis, given the way focus placement relates to de-accenting, and the implications of the latter. Perhaps the clear moral to be drawn is that we must be more careful about what we claim about the focal structure of utterances, as there are more matters to be considered than the impression of primary stress or contrast. In addition, the discussion raises other important questions about the pragmatics of prosody, including especially the function of the intonational phrasing which also seems to play a role in conveying the contrast. My suspicion that in examples like these the contrast involves a meta-linguistic use of prosody is partly inspired and strengthened by the role that focus plays in Horn's metalinguistic negation and in so-called *alternative questions*, a phenomenon to which I turn now.

§2.2.2.3. Yes/No vs. Alternative Questions

von Stechow notes that the string in (63) is ambiguous between a yes/no question reading and an alternative question reading. Though he doesn't discuss prosody, I believe these readings correspond to the alternate realizations roughly indicated in (63a) and (63b), respectively. (I ignore pitch accents here, and give only the phrase accents, foci and boundary tones):

[12]Horn gives examples combining contrastive focus with metalinguistic negation. He (1989:432-35) credits Bolinger (1961) and Carlson (1983) with earlier examples of that type.

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(63) Do you want coffee or tea?
a. [Do you want coffee or tea]$_F$?
H-H
b. [Do you want [coffee]$_F$] [or [tea]$_F$]?
H-H L-L

These should have the interpretations given in (64):

(64) a. {you want coffee∨tea}, where *coffee∨tea* is the meet of ⌊*coffee*⌋ and ⌊*tea*⌋
b. {you want u: u ∈ {coffee,tea}} = {you want coffee,you want tea}

The interpretation for (63a) in (64a) is arrived at straightforwardly. The simple yes/no question will set up a partition on the context set which has only two cells, one containing those worlds in which the single proposition in the set (64a) is true, and one containing those worlds in which it is false. The issue is how we arrive at the interpretation in (64b). Note that this is equivalent to the question denoted by the conjoined *Do you want coffee?, and do you want tea?*. The interpretation of (63) in (64b) thus involves a semantic version of conjunction reduction, converting the object language disjunction into metalanguage conjunction. von Stechow proposes that *or* in questions generally behaves as set union: At the content level it joins sets of worlds, but at the alternative level it joins sets of propositions. In his theory, (64b) is the straightforward reading, while (64a) must be explained by some additional mechanism (he basically uses quantifying-in). The account says nothing about the correlation between prosody and interpretation.

I would propose that *or* ordinarily (even in questions) has the standard Boolean interpretation, so that (63a)/(64a) is quite straightforward. But *or* sometimes has a metalinguistic use, whose function is to indicate contrasting alternatives expressed by the independently focused disjuncts. Compare Horn's (1985,1989) metalinguistic negation, which is also generally accompanied by narrow focus on the corrected or cancelled constituent. Horn argues (1989:379ff) that other operators, including *or*, also have metalinguistic interpretations, and offers examples like (65):

(65) Is the conductor Bernst[íː]n or Bernst[áː]n?

This is a question about the pronunciation of the conductor's name, and hence is clearly metalinguistic.

I would argue that in its metalinguistic use, *or* functions as suggested by von Stechow, yielding the union of the alternatives given by the disjuncts, which set then gives alternative values for a single focused argument in the utterance in question. Hence, (63b) presupposes that the question under discussion is *What do you want?*, {you want u: u ∈ D}. The particular alternatives provided suggest the natural class which we take to restrict D, so that it must include at least coffee and tea. The default final phrase/boundary tone sequence in (63b) is L-L, which suggests finality, i.e. that the alternatives given are the full set. Thus we arrive at the question {you want u: u ∈ D and u ∈ {coffee,tea}}. This is the set of propositions *want(you,coffee)* and *want(you,tea)* in (64b), as desired, equivalent to asking two, conjoined yes/no questions. (I take it that the exclusive sense of the disjunction arises from a conversational implicature, an assumption which is now fairly standard in the literature.) A final H-H sequence is also possible (like the H-H generally present at the end of the intonation phrase including *coffee*), which would suggest that there may be other beverages available as well.[33] Using

[33]That is, the alternative question (58b) may also be asked with the focal structure in (1).

metalinguistic disjunction, the desired result is obtained without conjunction reduction, and (63a) is not more complicated than it ought to be.

This view of how metalinguistic disjunction works also appears to be extendable to explain examples like Horn's (65). We do ask questions like *Is the conductor Bernstíf ín?*, meaning 'is his name pronounced like this?', and the present view would make (65) denote a conjunction of two such questions. This is comforting, but of course it doesn't mean that what I have suggested here constitutes a theory of the phenomenon in question. I have only argued that these phenomena are compatible with the theory of prosodic presuppositions outlined in this section.

§3. Further Applications of the Theory of Information Structure

The theory sketched in §§1 and 2 seems to capture what's essential about the type of alternative semantics promoted by Rooth (1992), but without any special anaphoric mechanism or focus-sensitivity. And it also promises to lead to a general, presuppositional theory of domain restriction for operators in natural language, along lines sketched in Calcagno (1996), von Fintel (1995), Roberts (1991/95), and Rooth (1992). But I think that it potentially has much broader applications. Here I will briefly outline some of the connections I see between this theory and other work in the pragmatic literature (from various fields) on a variety of issues. The thread that connects them is the notion of a plan or intention. Probably not everyone whose work I mention here would be comfortable with translating those notions into that of the goal, or question under discussion in a discourse, with the information structure in which that goal plays a part reflected in the common ground. However, if we are willing to do so, information structure turns out to be a central facet of pragmatic theory, unifying a number of apparently disparate issues and opening up some intriguing possibilities. The central claim is that the analysis of all these various pragmatic phenomena requires a richer notion of context than that generally given, one of the sort sketched in §1. Then many of the pragmatic phenomena in question can be seen as presuppositions about the structure of the context of utterance, its information structure, while others involve the generation of inferences which are partly triggered by constraints on how an utterance fits into that information structure. The task of analyzing those presuppositions or determining how those inferences are drawn is considerably lightened when we have a clearer notion of the organization of the flow of information in discourse.

Thomason (1990) argues that the common ground, plans (as developed in Planning Theory in artificial intelligence), and accommodation should be central components of a theory of pragmatics. He sketches how the interlocutors' discourse plans, information in the common ground, and plan inferencing play a crucial role in the calculation of the Gricean conversational implicatures intended by speakers; this is quite in keeping with Grice's own consistent relativization of implicature (and in fact, of non-natural meaning itself) to the speaker's intentions.[34] Further, both plans and conversational implicatures are accommodated to the common ground. In a sense, the present proposal can be seen

(i) Do you want [coffee]$_{F}$ or [tea]$_{F}$?
H H% H H%

(ii) [Do you want coffee]$_{F}$ or [tea]$_{F}$?
H H% H H%

Like (57b), the prosody in (i) seems to implicate that the hearer does want something; this is due to the fact that it is presupposed to be part of a strategy to answer the question *What do you want?*. (ii) also denotes (58b), but it doesn't presuppose such a super-question. Both (i) and (ii) clearly ask two yes/no questions, each marked by the H- phrase accent and H% boundary tone. All of this, of course, requires further investigation. See Pierrehumbert & Hirschberg (1990: 302ff) for relevant discussion.

[34] I believe that Thomason's student McCafferty (1987) takes a similar approach to conversational implicature, though I'm not directly familiar with his work.

as an extension of Thomason's vision of a pragmatic theory, using semantic questions and strategies of inquiry to capture the notions of *goal* and *plan*. As Sperber & Wilson (1986) argue in detail, one problem with the Gricean approach to date has been the vagueness in his definitions of the conversational maxims, and hence the indeterminacy about their applicability. Besides Relevance, Grice defined both maxims of Quantity relative to the "purposes of the conversation". It doesn't seem unreasonable to hope that their senses, as well as the often-cited problem of determining how to balance their conflicting requirements, might also be clarified through exploring their role in a framework based on InfoStr. Welker (1994) takes up the basic idea sketched in Thomason and develops a theory of plans in the common ground, in which conversational implicatures are generated by applying plan inference rules to contextual information (including already available information about the interlocutors' plans) plus the content of the utterance itself. Then, like other contextual entailments, implicatures are accommodated to the common ground. Her approach explores several types of implicature which are generally overlooked in less systematic approaches, as well as revealing the close relationship of conversational implicatures to other kinds of contextual entailments. In view of the work of Thomason and Welker, I speculate that we can use the same structures motivated here for focus in the generation of conversational implicatures, characterizing discourse plans in terms of strategies of inquiry. Roberts (1996b) is a first sketch of how this would work.

Some who work in Planning Theory (see Perreault (1990) and references therein) have recognized its utility in explaining and motivating the characteristics of various kinds of speech acts in discourse, characteristics which are otherwise simply stipulated, claimed to be primitive. In these theories, plan inferencing mechanisms may be used to draw conclusions about what speech act a speaker intended, even though the speech act type need not, contra Searle *et al.*, be part of the conventional content of the utterance. In terms of the present theory, this suggests that we can infer speech act information (is that a threat or a promise, an assertion or a warning?) partly from the relationship of an utterance to the strategy of inquiry in which it plays a role, and partly from the relationship of that strategy of inquiry to the domain plan(s) which it serves.

There is also a good deal of work on discourse cohesion and discourse segmentation, and the role of the latter in anaphora and inference, which I think could be related to the perspective developed here. One example is the work of Grosz & Sidner (1986) on the use of what they call the Intentional Structure of discourse to identify discourse segments, which in turn, they claim, play a constraining role on the possibility of anaphora in discourse. Sperber & Wilson (1986) attempt to reduce Gricean maxims of conversation to entailments derived from principles of rational behavior and facts about the limitations of human cognitive processing;[15] from the facts about cognitive processing follow coherence constraints such as Relevance (which they give a definition quite different from that in (15) above), while from the principles of rational behavior follow the development of rational strategies for achieving one's ends. They also discuss how Relevance plays a role in limiting the domains for inferencing in discourse, by restricting access to information which, although in the common ground, is not relevant to the issue at hand. The latter connection is particularly promising, suggesting that the strategies we develop limit the kinds of inferences we're likely to draw from the information we're given access to, given the common ground.

Another desideratum might be to develop a theory of topics and of topicalization (syntactic preposing), based on information structure. The discussion in §2.2.2 suggests a way of approaching the function of contrastive topics in terms of information structure, an approach which appears to be related to that of Büring (1994). However, topics, even when topicalized, are not all necessarily contrastive; for example, sometimes they do not

[15]Sperber & Wilson also attempt to reduce all the Gricean maxims to the single maxim of Relevance. However, I think this aspect of their argument is less successful.

bear Jackendoff's B accent (see Ward (1985) for lots of examples of topicalized constituents which are non-contrastive). Further, topics as defined by most authors aren't necessarily all preposed, so that it would seem desirable to give independent, though perhaps related, accounts of the functions of topichood and of topicalization. To my knowledge, no one has yet proposed a set of necessary and sufficient conditions for either topichood or for topicalization, so that it isn't entirely clear what the former notion is, what the latter's functional role is, or what their relationship may be. Even worse, I think there is reason to be skeptical about whether there is such a universal function as Topic, or Vallduví's (1993) Link, or even whether there is a unified pragmatic function of topicalization/preposing, apart from contrastive topics, there is no consistent conventional indication of topic- or Linkhood in a language like English, and see Culicover & Rochemont (1983) for suggestions that preposing may have multiple functions in English. See McNally (1995) for more discussion of the problems in defining what is meant by *Topic*. Focus-preposings would also fall under the theory of focus, but of course that wouldn't by itself explain their preposability. One thing which might be promising with respect to the utility of the present theory for the development of a theory of topics and topicalization is the possibility of explaining the contextual source of the salient partially ordered sets (PoSets) that Ward (1985) argues are presupposed by topicalization (though he doesn't explain why this should be or how these sets are contextually introduced in the general case).[30] If topicalized constituents are prosodically focused, which a preliminary review suggests that they are, these PoSets would be their corresponding alternative sets, and we would expect that they could be retrieved by studying the strategy of inquiry and in which these constructions occur and the common ground to determine what is Relevant.

There has been a good deal of interest lately in the use of rhetorical relations to structure discourse, following the work of Mann & Thompson (1987). I believe that Aristotle (I don't know where) claimed that logic was the basis for a science of rhetoric. That would be an interesting point of departure in exploring the relationship of rhetorical structures to the information structure posited here, with particular types of rhetorical relations over stretches of discourse characterized as types of strategies. Rhetorical relations can often, at least, be characterized in terms of questions and answers: e.g., the use of a *wh*-question and its answer to characterize explanations, etc. I suspect, however, that these relations often serve the goal, or question under discussion in another respect -- the goal of discourse is only partly to offer more information, and partly to achieve consensus about the value of the information contributed. So some rhetorical structures are intended principally to convince one's hearers that the information offered is worth adding to the common ground, e.g. by showing how it follows from or explains other known facts, etc. Studying these might lead to a more subtle grasp of the nature of information structure, and, in particular, of what it means to address a question under discussion.

Finally, if all these connections can be made, one of the advantages of this approach is that we only need to impose one primitive type of structure on the information in discourse, other than encyclopedic semantic networks and certain binary distinctions such as those between facts and default assumptions, or between explicitly introduced information and that which was only implicated, etc.[31] This hope is the basis of the subtitle of this paper -- *Towards an integrated theory of formal pragmatics*. If pragmatic

[30] This proposal in Ward is closely related to the assumption in Hirschberg (1985) that scalar implicature also requires salient PoSets, a requirement which should also fall out of the present approach, under the relation between implicature and prosodic focus noted in Rooth (1992).

[31] Louise McNally (p.c.) pointed out to me that information structure may not subsume the kind of relation between kinds of information sometimes referred to as the *figure/ground relation*, a relation sometimes apparently reflected in the use of frame adverbials, in the distinction between conjoined and subordinated clauses, etc. Though I suspect that this relationship should also be characterized presuppositionally, it may be that the kinds of presuppositions involved differ in interesting ways from those associated with prosodic focus.

explanations are ever to be theoretically reputable, they must be couched in terms of a theory of pragmatics which is explicit enough to be defeasible and sufficiently broad in scope to have something to say about the relationship between various kinds of purportedly pragmatic phenomena. The theory in §1 aims at such explicitness, and the brief notes in this section are intended to suggest its potential breadth. The proposed application to the analysis of focus is intended to suggest how such a theory could take some of the burden off of semantic theory, and ultimately I suspect off of syntactic theory as well, resulting in a simpler overall theory of interpretation while providing empirically superior accounts. Any theories which purport to offer pragmatic explanations should be gauged against such overarching desiderata, and not solely on the basis of claims to address some particular linguistic phenomenon in isolation.

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Interpretation of Korean Temporal Markers *-ESS* and *-NUN**

Eun Jung Yoo

1. Introduction

There have been various analyses of the temporal markers *-ess* and *-(nu)n*/-ϕ in Korean. Most of the previous studies on *-ess* and *-(nu)n*/-ϕ have been focused on their status in tense and aspect systems. Especially, the status and meaning of *-ess* have been controversial. There are three different positions for the analysis of *-ess*: to treat it as a past tense marker (Choe 1977, Chong 1990), an perfective/completive aspect marker (Baek 1986, S.K. Lee 1988) or a tense-aspect marker (H.S. Lee 1991, Choi 1993). As for *-(nu)n*/-ϕ, it is generally recognized that it refers to present or nonpast time, thus making it a present tense marker (Choe 1977, Baek 1986), but it is also sometimes taken to have an additional aspectual function, equivalent to progressive (Choe 1977) or imperfective (Kim 1988, H.S. Lee 1991).

The disagreement among various positions often arises from different employment of the conceptual or categorial classifications involved in tense and aspect systems. Moreover, even if there is a settled form of classification, it is very difficult to determine whether the marker *-ess* or *-(nu)n*/-ϕ has a particular category of tense or aspect meaning, given the complexity of the meaning that these markers have.

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In this paper, I will approach the meaning of *-ess* and *-(nu)n*/-ϕ in a different way, by focusing on the formal interpretation of the sentences that contain these markers. Thus the main purpose of this paper is to provide proper interpretations of *-ess*/*-(nu)n* sentences. After examining various meanings that these markers have in a sentence, I will propose that the semantic function of *-ess* and *-(nu)n*/-ϕ is to locate the involved eventuality within a 'completive interval' and an 'incompletive interval', respectively. This analysis is based on the framework of interval semantics presented in Dowty (1979), in which interpretations are relativized to intervals of time rather than moments in time [1]

The meaning of a third marker *-keyss* will be discussed as well in the later part of this paper, and it will be argued that *-keyss* is a modal instead of a temporal marker taking wide scope with respect to the temporal markers *-ess* and *-(nu)n*/-ϕ in its interpretation. In the last part of this paper, I will examine some implications of my analysis for the Korean tense and aspect system. Based on the interpretation of *-ess* and *-(nu)n*/-ϕ sentences, I will claim that the *-ess*/*-(nu)n* opposition involves both tense and aspect.

2. Interpretation of *-ess* sentences

2. 1. On the morpheme *-ess*

In order to derive an adequate interpretation of a sentence which involves *-ess*, we need to clarify the way in which *-ess* contributes to the meaning of the whole sentence. In many cases, Korean sentences with *-ess* describe events which happened in the past. (1) exemplifies this [2]

(1) Kim-i ecey Seoul-ul ttena-(e)ss-ta [3]
Kim-Sub yesterday Seoul- Obj leave-T-S
'Kim left Seoul yesterday.'

(1) would not cause any problem for the assumption that *-ess* refers to a past time so that its truth condition would require that there is a past time at which the event of Kim's leaving happened. Thus the rough translation of (1) can be given as follows without any contradiction in interpretation [4]

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[1] Though I adopt the framework of interval semantics in this paper, the analysis that I will propose here can be also presented within other kinds of frameworks such as event-based semantics and location-based semantics. To the best of my knowledge, the choice between these doesn't seem to be important for the present analysis. As for some advantages of location- or event-based theories over interval-based theories for other linguistic phenomena, see Roberts (to appear).

[2] Some abbreviations used in this paper are as follows:
Sub - subject marker; Obj - object marker; T - temporal marker; S- sentence type marker (This represents whether a sentence is declarative, interrogative or imperative. *-ta* is used for declarative sentences); Top - topic marker; Rel - relativizer; CF - contrastive focus marker.

[3] The vowel in *-ess* is deleted in a certain phonological environment.

[4] (i) "AT" is two place operator representing the notion of a proposition being true at a time.
Thus $AT(t_1, \varphi)$ is true at any time t, iff φ is true at the time denoted by t_1. (cf. Dowty, 1979:324)
(ii) "**past**(ζ)" is true at an interval i iff i' precedes i, where i' is the denotation of ζ.

(2) ∃t [yesterday'(t) & **past**(t) & AT (t, leave' (k,s))][5]

The same kind of interpretation can apply to all the *-ess* sentences, when there is a time adverbial which specifically denotes some past time as in (3).

(3) Kim-i o-nyen cen-ey cwuk-ess-ta.
Kim-Sub five-year ago-at die-T-S
'Kim died five years ago.'

However, when we consider the possible cooccurrence of *-ess* with some other time adverbials, we find that *-ess* may occur with adverbials whose reference is not limited to past time.

(4) a. Kim-i **yethay** chinkwu-lul kitali-ess-ta.
Kim-Sub until now friend-Obj wait-T-S
'Kim has waited for his/her friend until now.'
b. Kim-i **iceykkes** apeci-lul mos manna-(e)ss-ta.
Kim-Sub as yet father-Obj not meet-T-S
'Kim has not met his/her father as yet.'
c. Kim-i **cikum-kkaci** kongpwu-lul hay-(e)ss-ta.
Kim-Sub now-up till study-Obj do-T-S
'Kim has studied up till now.'

The adverbials *yethay, iceykkes*, and *cikum-kkaci* in (4) have "extended now" meaning in the sense that they describe an interval that began in the past and extends up to the present moment. Therefore, if we assume that *-ess* is a past tense marker and that it is introduced by a past tense rule, it will cause a contradiction between the "extended now" meaning of the adverbials and the past tense predicate in the interpretation of the sentences in (4).

Another reason why I don't want to assume that we need a Past Tense rule for *-ess* is that the *-ess* form of verbs can cooccur with adverbials whose denotations include the speech time as in (5).

(5) a. Kim-i cikum ttena-(e)ss-ta.
Kim-Sub now leave-T-S
'Kim has left now.'
b. Kim-i cikum i swunkan ku il-ul kkuthnay-(e)ss-ta.
Kim-Sub now this moment the work-Obj finish-T-S
'Kim has finished the work at this very moment.'

---

[5] *today* translates as:
(i) $\lambda t \exists t_1 [\text{day}'(t_1) \,\&\, [\text{NOW} \subseteq t_1 \,\&\, t \subseteq t_1]]$

yesterday translates as:
(ii) $\lambda t \exists t_1 [[\text{day}'(t_1) \,\&\, \forall t_2\, [\text{today}'(t_2) \rightarrow [t_1 < t_2 \,\&\, \forall t_3\, [[t_1 < t_3 \,\&\, t_3 < t_2] \rightarrow \text{today}'(t_3)]]]] \,\&\, t \subseteq t_1]$

Cf. the translation of *yesterday* and *today* in Stump (1985: 381).

It can be argued that the time denoted by the adverb *cikum* in (5a) is actually a very recent past rather that the present, since (5a) can be uttered when Kim's leaving occurred just before the speech time. However, there are still many cases where *-ess* is used together with *cikum* whose denotation includes the utterance time. Consider (6).

(6) Cikum nay-ka malhako-iss-nu-n i swunkan-ey ce ay-ka nemeci-ess-ney
now I-Sub speaking-be-T-Rel this moment-at that child-Sub fall-T-S
'That child has fallen down at the moment of my speaking now.'

In (6), the event of the child's falling down is cotemporaneous with the utterance of the sentence. Accordingly, if we try to interpret (5) and (6) using a past tense rule, it would lead to contradiction, since no interval can satisfy **past**(t) and the denotation of *cikum* at the same time.

Based on the examples (1)-(6), we can conclude that the meaning of *-ess* should be described in a way that it allows for either a past or 'extended now' meaning. The same line of idea is proposed in Stump (1985) in his account of English perfect. Stump argues that it is wrong to assume that the function of the perfect is to locate an event within an extended now. Then he proposes the notion of a *perfect interval* which is defined in (7).[6]

(7) The denotation of **perf**(t) is

$$[\exists t_1[t_1 \subseteq t \,\&\, t_1 < \textbf{now}] \,\&\, \neg \exists t_1\,[t_1 \subseteq t \,\&\, \textbf{now} < t_1]]$$

Given (7), some perfect intervals (relative to i) are illustrated in (8).

(8) i_1, i_2, i_3 are *perfect intervals* relative to i. **now** denotes i.

Now, what I want to claim is that the interpretation of the Korean *-ess* can be captured best in terms of perfect intervals in Stump's sense. This view accounts for the fact that *-ess* can cooccur with either of *ecey* 'yesterday' or *yethay* 'so far'. Moreover, it explains why *-ess* is not used with adverbials of future reference such as *nayil* 'tomorrow'.[7]

[6] Stump (1985) introduces the new intensional logic predicate 'perf (ζ)' where ζ denotes a time interval t', and assumes perf (ζ) to be true at index <w,t> iff t' begins before t and lasts no later than t.

[7] It is not always true that *-ess* cannot be used with future adverbials such as *nayil*. It has been observed that the following sentence is fine, when *-ess* is used figuratively such as in

(i) Ne nayil cwuk-ess-e!
you tomorrow die-T-S
'You have died / died tomorrow'

(9) *Kim-un nayil Seoul-ul ttena-(e)ss-ta [8]
Kim-Top tomorrow Seoul-Obj leave-T-S
'* Kim left / has left Seoul tomorrow'

In the following section 3, the meaning of *-ess* will be discussed in comparison with *-(nu)n* /-ϕ, and I will use the term 'completive interval' instead of perfect interval in order to contrast the meaning of *-ess* with that of *-(nu)n*/-ϕ and in order to avoid the possible confusion with English-type perfect.[9] Therefore, in the subsequent discussion, it will be assumed that *-ess* introduces a 'completive interval' predicate, **compl,** whose denotation is the same as that of Stump's perfect interval, as in (10).

(10) The denotation of **compl**(t) is

$$[\exists t_1[t_1 \subseteq t \ \& \ t_1 < \textbf{now}] \ \& \ \neg \exists t_1 \ [t_1 \subseteq t \ \& \ \textbf{now} < t_1]]$$

Given the assumption that *-ess* locates an event within a completive interval, it follows that (11b) is true at i, iff (11a) is true sometime during a completive interval relative to i.

(11) a Kim-i sakwa-lul hana meke-chiwu-ta
Kim-Sub book-Obj one eat-up-S
'Kim eats up an apple.'
b Kim-i sakwa-lul hana meke-chiwu-(e)ss-ta
Kim-Sub book-Obj one eat-up-T-S
'Kim ate up an apple.'

However, a problem arises, when we consider the aspectual class of the verb *meke-chiwu-* 'eat up' in (11). Even though (11b) asserts that (11a) is true at a completive interval i which does not extend into some future time, it itself does not block the possibility that (11a) is also true at a superinterval of i. Accordingly, (11b) can be counted as true in a situation where Kim is in the middle of eating at the speech time and does not finish eating until some future time.[10] As telic predicates such as *chayk-ul hankwen ilke chiwu-* 'read off a book', *sakwa-lul hana meke-chiwu peli-* 'eat up an apple', *tochakha-* 'arrive' and *alachay-* 'notice' do not allow a sentence which is true at an interval i to be true at the superinterval of i, we need to impose a telicity condition as in (12), which is proposed in Dowty (1987 18).

(12) If δ is a telic predicate, then the truth of $\delta(x_1, \ldots, x_n)$ for interval t entails that $\delta(x_1, \ldots, x_n)$ is false for all proper subintervals t' of t.

In (1), the speaker describes the event as if it has already occurred to express his/her strong intention that s/he will defeat the hearer in the following day. I don't have any compositional way of deriving (1) with this figurative usage of *-ess*.

[8]The use of * in this paper does not necessarily mean that the following sentence is syntactically unacceptable. Rather it is also used when a sentence involves contradictory entailments as in (9).

[9]It should be pointed out that the use of the term 'completive' itself does not mean that *-ess* is an aspect marker rather than a tense marker. The relation between this term and Korean tense and aspect system will be discussed in the section 5.

[10]This problem was pointed out to me by David Dowty, and I owe him the subsequent discussion.

The condition (12) guarantees that when a sentence with a telic predicate is true for i, it is false for a superinterval of i as well as a subinterval of i, because otherwise the superinterval of i would violate (12). Accordingly, for a sentence with a telic predicate, there is always a 'unique interval' i for which the sentence is true.

Interestingly enough, *-ess* sentences with atelic predicates may also have a similar problem in that they are often not true in a situation where the described state or activity extends to some future time. However, I will put the discussion of this phenomena aside until we can compare the meaning of *-ess* with that of *-(nu)n* -ϕ in the section 3.

2.2. Translations of *-ess* sentences

In this section, I will show how we can derive a desirable interpretation of sentences with *-ess* by using completive intervals. Most of Stump's system is assumed, that is, the use of temporal abstracts (TAB) and the way in which temporal adverbials are introduced. TAB is the basic category of temporal abstracts, and though expressions of this category may have the superficial form of sentences, they have different denotations from sentences: they denote sets of time intervals.

Let us consider (1), which is repeated below.

(1) Kim-i ecey Seoul-ul ttena-(e)ss-ta
Kim-Sub yesterday Seoul-Obj leave-T-S
'Kim left Seoul yesterday.'

First, we need a temporal abstract rule to convert type t (sentential) constituents into abstracts over intervals as follows, where I use the feature [Temporal] which subsumes both tense and aspect marking.

(13) S 11 If $\phi \in P_t$, [-Temporal], then $F_{11}(\phi) \in P_{TAB}$[-Temporal], where $F_{11}(\phi)$ is ϕ
T 11 If $\phi \in P_t$ and ϕ translates as ϕ', then $F_{11}(\phi)$ translates as $\lambda t[AT(t, \phi')]$

Next, time adverbs are added to temporal abstracts by the following rule.[11]

(14) S 21 If $\alpha \in P_{MTA}$ and $\beta \in P_{TAB}$[γTemporal], then $F_{21}(\alpha,\beta) \in P_{TAB}$[$\gamma$Temporal], where $F_{21}(\alpha,\beta)$ is the result of placing α after the subject of β.[12]
T 21 If $\alpha \in P_{MTA}$, $\beta \in P_{TAB}$, and α, β translate as α', β', then $F_{21}(\alpha,\beta)$ translates as $\alpha'(\hat{}\beta')$

Then, *-ess* is introduced to the temporal abstracts by the following rule.

(15) S 12 If $\alpha \in P_{TAB}$[-Temporal], then $F_{12}(\alpha) \in P_{TAB}$[+Temporal], where $F_{12}(\alpha)$ is the result of placing *-(e)ss* after the root of the verb or adjective of α.

[11] MTA is the category TAB/TAB of main tense adverbs.
[12] Here I assume that the canonical position of adverbials in Korean is right after a subject (and before an object, if any). The relatively free order of adverbials as well as arguments (such as objects and subjects) in Korean can be captured by an independent syntactic rule or mechanism (i.e., scrambling).

152 BEST COPY AVAILABLE

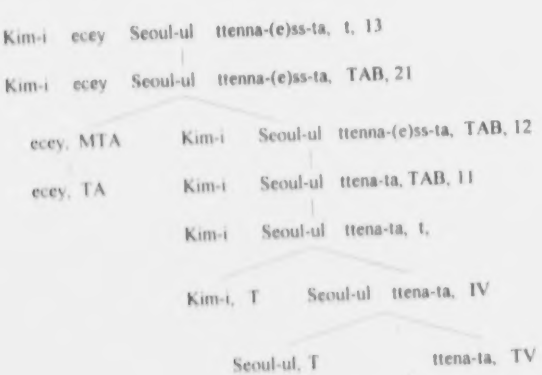
T 12 If $\alpha \in P_{TAB}$ and α translates as α', then $F_{12}(\alpha)$ translates as λt[**compl**(t) & $\alpha'(t)$]

Finally, the temporal abstract with the feature [+Temporal] is converted to a sentence by the following rule

(16) S 13 If $\alpha \in P_{TAB}$[+Temporal], then $F_{13}(\alpha) \in P_t$[+Temporal], where $F_{13}(\alpha)$ is α
T 13 If $\alpha \in P_{TAB}$ and α translates as α', then $F_{13}(\alpha)$ translates as $\exists t[\alpha'(t)]$

Now, given the above rules, we can assign an analysis tree for (1) as in (17) and get the interpretation in (18) [13]

(17)



(18) $\exists t$[yesterday'(t) & [**compl**(t) & AT(t, leave'(k,s))]]

3. Interpretation of *-(nu)n* sentences

3.1. On the morpheme *-(nu)n*

When it is assumed that there is a distinction between present tense (or nonpast tense) and past tense, the morpheme *-(nu)n* $-\phi$ is usually identified as present (or nonpast) morpheme [14] In fact, in many cases *-(nu)n* $-\phi$ is used in a present situation as follows:

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[13] In (17), I assume the rule creating main tense adverbs of Stump (1985), by which set-level time adverbs (TA) become main tense adverbs (MTA). Thus, if $\alpha \in P_{TA}$ and α translates as α', then the result of this rule α ($\in P_{MTA}$) translates as $\lambda P^t[\alpha'(t)$ & $P^t(t)]$.
(Cf. The variable P^t is of the type $<s, <i,t>>$.)

[14] *-nu* is deleted from *-nun* when the root of a verb ends with a vowel.

(19) Kim-i cikum cemsim-ul mek-nun-ta
Kim-Sub now lunch-Obj eat-T-S
'Kim eats lunch now.'

The morpheme *-(nu)n* -φ is also used to express habitual events or eternal truth, like the English present tense.

(20) a Cikwu-nun to-n-ta
earth-Top turn-round-T-S
'The earth turns round.'
b Kim-un mayil san-ul olu-n-ta
Kim-Top everyday mountain-Obj climb-T-S
'Kim climbs the mountain everyday.'

Moreover, *-(nu)n* -φ can be used with future adverbs, when the speaker is sure that the involved eventuality will occur.

(21) Kim-un nayil hakkyo-ey ka-n-ta
Kim-Top tomorrow school-to go-T-S
'Kim goes to school tomorrow.'

The sentences (19) - (21) would be accounted for if we assume a present (or nonpast) interval that does not include any past time.[15] However, what is peculiar about the morpheme *-(nu)n* -φ is that it can cooccur with an adverbial whose denotation contains a time which is earlier than the speech time as in (22).

(22) Kim-i ecey-pwuthe ca-n-ta
Kim-Sub yesterday-from sleep-T-S
'Kim has slept since yesterday. (He is not awake yet, and will sleep for a while.)'

One might want to regard *-(nu)n* -φ in (22) as a present tense marker and interpret (22) in terms of an extended now interval which began on the previous day and lasts up to the present. However, this view fails to account for the following example.

(23) I namwu-nun cinan-tal-pwuthe naytal-kkaci kkoch-ul phiwu-n-ta
this tree-Top last-month-from next-month-until flower-Obj blossom-T-S
'This tree came into blossom last month, and will blossom until next month.'

In (23), the interval which begins in the past and extends up to a certain future time cannot be captured by an extended now interval. Therefore, we can conclude that a present tense rule is not appropriate for the interpretation of (22) and (23).

[15]Stump defines NONPAST intervals as follows.
(i) Given that NOW denotes i',
PRES (ζ) is true iff i'' $\subseteq$ i', where i'' is the denotation of ζ;
NONPAST (ζ) is true iff there is no subinterval i'' of the denotation of ζ such that i'' < i'.

Then, what would be a denotation of *-(nu)n* -∅? To get a clearer sense, we can compare (19) with (24)

(24) Kim-i cikum cemsim-ul mek-ess-ta
Kim-Sub now lunch-Obj eat-T-S
'Kim has eaten lunch now.'

In (19), Kim's eating still continues at the evaluation time, i.e., it is not completed. On the other hand, in (24) Kim's eating is completed before or at the evaluation time.[16] The same contrast holds between (25) and (26)

(25) Kim-i yethay ca-n-ta
Kim-Sub until now sleep-T-S
'Kim has slept until now. (He is not awake yet.)'

(26) Kim-i yethay ca-(e)ss-ta
Kim-Sub until now sleep-T-S
'Kim has slept until now. (He is awake now.)'

The difference between these two lies in whether the described state is terminated by the evaluation time. Thus, a contrast arises from the addition of a conjunct as in the following examples

(27) a Kim-i yethay ca-(e)ss-ta, kulena icey-nun ilena-n-ta
Kim-Sub until now sleep-T-S but now-Top get up-T-S
'Kim has until now, but now s/he is getting up.'
b #Kim-i yethay ca-n-ta, kulena icey-nun ilena-n-ta
Kim-Sub until now sleep-T-S but now-Top get up-T-S
'Kim has slept until now, but now s/he is getting up.'

Therefore, the interval i' for which (22), (23) or (25) is true can be shown as follows, where i is the interval of evaluation

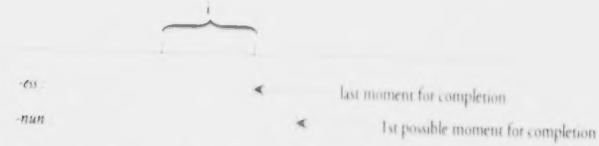
(28)

[16] It seems that Korean *cikum* has a somewhat broader range of meaning so that its denotation may include the very near past and future. Accordingly the translation of *cikum* may tentatively be given as in (i), assuming that the present time span represented by *cikum* can be expressed via a predicate such as **current-event**(ζ).
(i) *cikum* translates as
$\lambda P^{i}\lambda t[\exists t_1[\mathbf{now} \subset t_1 \,\&\, \mathbf{current\text{-}event}(t_1) \,\&\, t \subset t_1] \,\&\, P^{i}[t]]$

Accordingly, the interval i' in (28) cannot be captured by either a present or a nonpast interval

Instead, I want to propose an analysis of *-(nu)n* -ϕ in terms of an 'incompletive interval', since all the sentences with *-(nu)n* -ϕ entail that the described eventuality is not completed yet. As *-(nu)n* -ϕ is used for an ongoing eventuality or for an eventuality which is certain to occur, the possible moment of the completion of the eventuality comes after the evaluation time. This can be represented as in (29) in contrast with the meaning of *-ess*

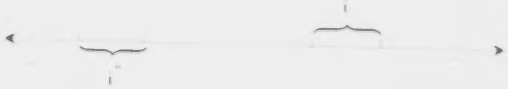
(29)



A similar argument is found in Kim (1988), where it is argued that *-(nu)n* -ϕ represents unfinishedness or incompletedness. According to that analysis, sentences such as (20) involve incompletedness in the sense that the same event will occur continuously or repeatedly. (21) also involves incompletedness, since the described event (i.e., Kim's going to school) has not happened or is not yet completed at the interval of evaluation

Although *-(nu)n* -ϕ may include times earlier than the speaker's interval, it cannot solely consist of an interval earlier than the interval of evaluation. That is, in (30), the interval i" which is relative to i cannot be the time of the eventuality described in *-(nu)n* -ϕ sentences

(30)



This is shown in the unacceptability of the following sentence

(31) a *Kim-i ecey kongpwuha-n-ta
Kim-Sub yesterday study-T-S
'*Kim studies yesterday'

b *Kim-i cokum cen-ey ttena-n-ta
Kim-Sub minute ago-at leave-T-S
'*Kim leaves a minute ago'

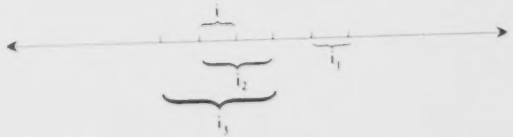
Based on these characteristics of *-(nu)n* -ϕ, I propose that *-(nu)n* -ϕ locates an eventuality within an incompletive interval which can be defined as follows

(32) The denotation of **incompl**(t) is

$[\exists t_1[t_1 \subseteq t \ \& \ \mathbf{now} < t_1]]$

According to (32), i_1, i_2, i_3 in the following diagram (33) are incompletive intervals relative to i:

(33)



As (32) does not say that **incompl**(t) cannot include an interval which precedes i, i_3 can be an incompletive interval relative to i and (22) can be taken care of. The incompletive interval in (20) corresponds to i_2 in (33). Likewise, i_1 is an incompletive interval in (21). The specific syntactic rule and translation rule by which *-(nu)n*/-ϕ sentences are interpreted will be discussed in the following section, and those rules are based on the assumption that *-(nu)n*/-ϕ locates an involved eventuality within an incompletive interval.

Now, given the denotation of an incompletive interval in (32) and that of a completive interval in (10), it would be useful to consider the logical relationship between these two. Completive intervals and incompletive intervals are complementary, since any incompletive interval should include a subinterval which is preceded by **now** in (32), whereas a completive interval cannot include a subinterval which is preceded by **now** in (10). Thus given any interval *t*, either **compl**(i) is true or **incompl**(i) is true, and **compl**(i) and **incompl**(i) are never both true at the same time.

In the discussion of *-ess* in section 2.1 of this paper, it was argued that for telic predicates we need the condition (12) to guarantee that a sentence involving a telic predicate is true only for a single interval. This condition is useful for *-(nu)n* -ϕ sentences with telics such as (34) as well.

(34) Kim-i sakwa-lul hana ta mek-nun-ta
Kim-Sub apple-Obj one all eat-T-S
'Kim eats a whole apple.'

The proposition in (34) is not true in a situation in which Kim's eating a whole apple is finished by the speech time. However, without (12), the sentence (34) could also be true for an interval which does not extend beyond the speech time, since when a sentence ϕ is true for an interval i, it can also be true in a subinterval of i. Therefore, (12) is necessary to block this possibility.

At the end of section 2.1, it was mentioned that *-ess* sentences with atelic predicates (as well as telic predicates) seem to have a 'unique' interval interpretation in the sense that

they are usually not true in a situation where the described state or activity extends to some future time beyond the speech time. This is shown in (26), which is repeated here.

(26) Kim-i yethay ca-(e)ss-ta
Kim-Sub until now sleep-T-S
'Kim has slept until now. (He is awake now.)'

This is surprising given the 'homogeneity' of atelic predicates. One way of explaining this is to assume that the meaning of *-ess* itself imposes a 'unique' interval condition so that a *-ess* sentence is true only for a single interval (which is a completive interval).

However, this approach is problematic, because some *-ess* sentences may be true even when the described state or activity extends into the present. (35) exemplifies this.

(35) Kim-i ecey-pwuthe aphu-ess-ta
Kim-Sub yesterday-from sick-T-S
'Kim was sick from yesterday.'

The fact that (35) may be true when the state is persistent beyond the speech time is clearly shown in (36).

(36) Kim-i ecey-pwuthe aphu-ess-ta, kulentey acikto aphu-ϕ-ta
Kim-Sub yesterday-from sick-T-S yet still sick-T-S
'Kim was sick from yesterday, and yet he is still sick.'

Given (36), we can explain the 'telicity' of *-ess* sentences by means of conversational implicature rather than by entailment. Since the eventualities described by *-ess* sentences are usually interpreted as being terminated before or at the speech time as in (26) whereas those described by *-(nu)n*/*-ϕ* sentences are usually interpreted as not being terminated by the speech time as in (25), we can assume that this arises from a conversational implicature. That is, given two equally brief forms *-ess* and *-nun*, it would be more informative to make the stronger assertion (25) rather than (26) in a situation where Kim's sleeping extends into the present.

One of the supporting argument for the conversational implicature approach is that this implicature is cancelable or defeasible as shown in (36), which is a fundamental characteristic of conversational implicatures. Another kind of example that shows cancelability is found in question-answer contexts.

(37) a A Kim-i twu-si-kkaci mwues hay-(e)ss-ni?
Kim-Sub two-o'clock-until what do-T-S(question marker)
'What did Kim do until 2 o'clock?'
b B Kim-i twu-si-kkaci kongpwuhay-(e)ss-e
Kim-Sub two-o'clock-until study-T-S(informal)
Sasil cikum-kkaci kyeysok kongpwuha-ϕ-e
in-fact now-up-till continuously study-T-S(informal)
'Kim studied until 2 o'clock. In fact, he has studied until now.'

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More evidence in support of the conversational implicature approach comes from the fact that this implicature is calculable based on the maxim of quantity. Consider the examples (25) and (26) again.

(25) Kim-i yethay ca-n-ta.
Kim-Sub until now sleep-T-S
'Kim has slept until now. (He is not awake yet.)'

(26) Kim-i yethay ca-(e)ss-ta.
Kim-Sub until now sleep-T-S
'Kim has slept until now. (He is awake now.)'

We can say that (25) is stronger than (26), because in (25) the incompletedness of Kim's sleeping is asserted by *-(nu)n -ϕ*, whereas in (26) the incompletedness of Kim's sleeping at the speech time is just possible due to the characteristic of the atelic predicate. Given such a relation of relative strength, and the maxim of quantity that tells speakers to be as informative as is required, the fact that the speaker states only (26) suggests that the speaker lacks evidence for (25) and s/he is not in the position to claim (25). Therefore, the use of *-ess* in (26) implicates that Kim's sleeping does not extend to the present in ordinary circumstances.[17]

There is one thing to be noted about *-(nu)n*. In Korean, adjectives alone are used as predicates just like verbs, however, in that case *-(nu)n* is never attached to them.

(38) a *Kim-i pwucilenha-n-ta.
Kim-Sub diligent-T-S
'Kim is diligent.'
b Kim-i pwucilenha-ϕ-ta.
Kim-Sub diligent-T-S
'Kim is diligent'

On the other hand, this distinction does not hold for *-ess*.

[17]It seems that the conversational implicature associated with *-ess -nun* may not arise when a sentence has an adverbial with *-pwuthe* 'from' as in (35). That is, (35) can be used even when the speaker knows that Kim's illness extends into the present. However, this kind of usuage arises when information about Kim's illness is already salient in the context, or when Kim's present state does not matter. This seems to be because *-pwuthe* adverbials usually force the involved eventuality to be focused on the inceptive time of the eventuality. In another kind of situation where Kim's illness is new information in the context and his/her present state can be a matter of concern, a sentence with *-nun/-ϕ* is used when Kim's illness extends into the present, as it is predicted by our conversational implicature. Thus if the speker informs a doctor of his/her child's present illness by telephone, then a *-nun/-ϕ* form is used as in (i), and the use of a *-ess* form is very awkward.

(i) Sensayngnim, wuli ai-ka ecey-pwuthe aphu-ϕ-ayo.
doctor my child-Sub yesterday-from sick-T-S (informal, polite)
'Doctor, my child has been sick since yesterday.'

(39) Kim-i celm-ul-ttay pwucilenhay-(e)ss-ta
Kim-Sub young-Rel-time diligent-T-S
'Kim was diligent when young'

Kim (1988) argues that *-(nu)n* has a dual semantic function, one which distinguishes verbs from adjectives, and the other as a temporal marker. According to this view, what makes *-(nu)n* compatible with verbs is the semantic function of *-(nu)n* that expresses "change". However, I think that this is too broad a generalization, since stative verbs such as *sarangha-* 'love' and *al-* 'know' do not involve a meaning component of change, though they can be affixed with *-(nu)n*.[18] Moreover, this suggests that compatibility of *-(nu)n* with verbs may not be relevant to the semantics of *-(nu)n*. It might be simply because of the syntactic function of *-(nu)n* which distinguishes verbs from adjectives.

Moreover, the occurrence of *-(nu)n* seems to be restricted by other affixes in a verb form. For example, *-(nu)n* is not used even with verbs, if the declarative sentence ending is *-e*, which is used in informal register.

(40) Kim-i mayil swul-ul masi-ϕ-e
Kim-Sub everyday liquor drink-T-S(very informal)
'Kim drinks everyday'

However, the use of *-(nu)n* is not determined by the choice of register, either, since other sentence endings such as *-kwuna*, which is also used in informal register, distinguish verbs from adjectives via *-(nu)n*.

(41) a Ney-ka yocum pwule-lul paywu-(nu)n-kwuna
you-Sub nowadays French-Obj learn-T-S(informal, colloquial style)
'You learn French nowadays'
b Ney-ka yocum pappu-ϕ-kwuna
you-Sub nowadays busy-T-S(informal, colloquial style)
'You are busy nowadays'

Therefore, at this point, I cannot find any convincing semantic or pragmatic account for why *-(nu)n* is not used with certain sentence endings, and why it attaches to verbs but not adjectives when it is employed.

3.2. Translations of *-(nu)n* sentences

To derive the desired interpretation of sentences with *-(nu)n -ϕ*, we need the following rule:

[18] Though verbs such as *sarangha-* and *al-* are usually classified as stative verbs, they are different from (stative) adjectives in the respect that they can be used in progressive forms. It might be the case that *-ko-iss*, which is usually assumed to be progressive marking in Korean, has a different meaning from English progressive tense.

(42) S 14 If $\alpha \in P_{TAB}$[-Temporal], then $F_{14}(\alpha) \in P_{TAB}$[+Temporal], where $F_{14a}(\alpha)$ is the result of placing ***-(m)n*** in the predicate of α when it is a verb, and $F_{14b}(\alpha)$ is α when the predicate is an adjective

T 14 If $\alpha \in P_{TAB}$ and α translates α', then $F_{14}(\alpha)$ translates as λt [**incompl**(t) & $\alpha'(t)$]

Now, (22) is interpreted as in (44), given the translation of *ecey-pwuthe* in (43)

(22) Kim-i ecey-pwuthe ca-n-ta
Kim-Sub yesterday-from sleep-T-S
'Kim has slept since yesterday (He is not awake yet, and will sleep for a while)'

(43) *ecey-pwuthe* translates as
$\lambda P'\lambda t\ [\exists t_1[ecey'(t_1) \& t_1 \subset t \& \neg\exists t_2[t_2 \subset t \& t_2 < t_1\ ]]\ \&\ P'\{t\}]$[19]

(44) a

Kim-i ecey-pwuthe ca-n-ta, t, 13
Kim-i ecey-pwuthe ca-n-ta, TAB, 21

ecey-pwuthe, MTA
Kim-i ca-n-ta, TAB, 14
Kim-i ca-ta, TAB, 11
Kim-i ca-ta, t,
Kim-i, T ca-ta, IV

b $\exists t\ [\exists t_1\ [yesterday'(t_1) \& t_1 \subset t \& \neg\exists t_2[t_2 \subset t \& t_2 < t_1\ ]]\ \&$ **incompl**(t) & AT (t, sleep'(k))]

The infelicity of (31a) is predicted, since (31a) will have the following contradictory translation

(45) $\exists t$ [ecey'(t) & [**incompl** (t) & AT(t, study'(k))]]

There is no interval t such that both ecey'(t) and **incompl**(t) are true at the same time. On the other hand, we can get the desired translation of (21) as follows without any contradiction

[19]The translation of *ecey-pwuthe* can be obtained compositionally from *ecey* (of the category TA) and *pwuthe* (of the category MTA/TA), if we assume (i) and (ii):

(i) *pwuthe* translates as
$\lambda P'\lambda Q'\lambda t\ [\exists t_1[\alpha'(t_1) \& t_1 \subset t \& \neg\exists t_2[t_2 \subset t \& t_2 < t_1\ ]]\ \&\ P'\{t\}]$

(ii) If $\alpha \in P_{MTA/TA}$, $\beta \in P_{TA}$, and α, β translates as α', β', then $F(\alpha, \beta)$ translates as $\alpha'(\hat{}\ \beta')$

(21) Kim-un nayil hakkyo-ey ka-n-ta
Kim-Top tomorrow school-to go-T-S
'Kim goes to school tomorrow'

(46) ∃t [tomorrow'(t) & [**incompl** (t) & AT(t, go-to-school'(k))]]

4. On the morpheme *-keyss*

The morpheme *-keyss* has been treated as a future tense marker in earlier literature In fact, in many cases *-keyss* seems to represent futurity as in the following sentence

(47) Nay-ka nayil hakkyo-ey ka-keyss-ta
I-Sub tomorrow school-to go-will /Volitional-S
'I will go to school tomorrow'

However, recent studies such as Chong (1990) argue against the view that analyzes *-keyss* as a future tense marker Chong observes that the sentences in (48) does not describe a future state

(48) Ne-uy tali-ka aphu-keyss-ta
you-Possessive leg-Sub be-hurt-Presumptive-S
'I presume that your legs are hurt (or hurting) / your legs must be hurt'

According to her, *-keyss* is a modal marker which represents the speaker's presumption as in (48) or the speaker's volition as in (47) at the time of utterance I know of no reason to disagree with Chong's conclusion that *-keyss* is not a future tense marker This view is supported by the following example where we have both *-ess* and *-keyss*

(49) Kim-i ecey phikonhay-(e)ss-keyss-ta
Kim-Sub yesterday be-tired-T- Presumptive-S
'I presume Kim was tired yesterday / Probably Kim was tired yesterday'

It is very difficult to see how an account for the above sentence can be given that relies on distinctions among present, past, and future tense

Another reason that we need to treat *-keyss* as a modal comes from the truth conditional characteristics that sentences with *-keyss* have In section 3, we saw that *-(nu)n* can be used in describing a future eventuality when it is somehow predetermined and assured by the speaker Therefore, the following (50) would turn out to be false, if the asserted event did not happen after all

(50) Kim-i naynyen-ey tayhak-ey ka-n-ta
Kim-Sub next year college-to enter-T-S
'Kim enters a college next year'

On the other hand, (51) is not false, even if Kim could not enter a college by some reason

(51) Kim-i naynyen-ey tayhak-ey ka-keyss-ta
Kim-Sub next year college-to enter-Presumptive-S
'I presume that Kim will enter a college next year.'

This is because Kim's entering a college is judged to happen based on the epistemic evidence available to the speaker, but not asserted by the speaker as a fact.

There is another possible future expression in Korean, *-ul-kes-i*. Though I will not discuss the difference between *-keyss* and *-ul-kes-i* in detail, it can be described roughly as follows. The use of *-keyss* is subjective in the sense that the epistemic judgment comes from the speaker, given the common ground shared between the speaker and the hearer. On the other hand, *-ul-kes-i* is objective in the sense that the epistemic judgment comes from the speaker's authoritative or objective knowledge which is often not shared with the hearer.[20] In spite of this difference, *-ul-kes-i* should be treated as a modal marker as well, since it can be used with *-ess* as in (52), and the sentence containing it is true even if the described eventuality has not occurred after all.

(52) Ku-ka ecey phikonhay-(e)ss-ul-kes-i-ta
he-Sub yesterday tired-T-Presumptive-S
'I presume that he was tired yesterday / Probably he was tired yesterday.'

In the preceding sections, I argued that temporal interpretation of Korean is assigned in terms of either **compl**(t) or **incompl**(t). As for incompletive intervals, we saw that only verbs are marked with *-(nu)n* whereas adjectives are not marked (or marked with a zero morpheme). There is one thing to note about the sentences with *-keyss* with respect to incompletive marking. As we saw in (51), the verb is not marked with *-(nu)n* when *-keyss* is attached to it. The same thing happens even when *-keyss* is used as a volitional marker as in (47). In these cases, we can assume that there is a morphological cooccurrence restriction between *-keyss* and *-(nu)n*, so a zero form is employed for the incompletive marker. This explains why (53) is a presumption about an event which would happen at an incompletive interval.

(53) Ne yocum cip-cis-ϕ-keyss-ta
you these days house-build-T-Presumptive-S
'I presume that you build houses these days.'

Sohn (1974) observes that the use of volitional *-keyss* is more restricted than that of presumptive *-keyss* in the sense that i) the volitional *-keyss* cannot be used with a verb which is affixed with *-ess*, ii) the volitional *-keyss* cannot be used with stative verbs, and iii) the subject of a sentence with the volitional *-keyss* should be first person. On the other hand, presumptive *-keyss* does not show this kind of restriction in its usage. Therefore, in the following discussion, I will focus on the usage of presumptive *-keyss*.

Let us consider (49) first. (49) is a present presumption about an event which occurred earlier than the utterance time. Therefore, when both completive *-ess* and modal

[20] There are other views on the difference between *-keyss* and *-ul-kess-i* as well. As for the distinction from an interactional perspective, see Suh & Kim (1991).

-keyss are used together, the modal *-keyss* should have wider scope. Otherwise, (49) would be interpreted as a presumption made at a completive interval. For this reason, I will assume that the modal *-keyss* is introduced after a sentence is marked as either completive or incompletive. This is shown in the rule (54), where *-keyss* is assumed to belong to the category MOD.

(54) S 31 If $\alpha \in P_{MOD}$ and $\phi \in P_t$[+Temporal], then $F_{31}(\alpha,\phi) \in P_t$[+Temporal], where $F_{31}(\alpha, \phi)$ is the result of placing α in the predicate of ϕ.[21]

T 31 If $\alpha \in P_{MOD}$, $\phi \in P_t$, and α, ϕ translate as α', ϕ', then $F_{31}(\alpha, \phi)$ translates as $\alpha'(\hat{}\phi')$

As the meaning of presumptive *-keyss* seems to be close to the 'weak necessity' of Kratzer (1991), I will use the operator '$\Box_{presum}$' to express this.[22] The denotation of presumptive *-keyss* can be given as follows.[23]

(55) **-keyss'** (presumptive) $\lambda p [\Box_{presum} p]$[24]

Now, based on (54) and (55), (49) can be derived and translated as follows.

(49) Kim-i ecey phikonhay-(e)ss-keyss-ta
Kim-Sub yesterday be-tired-T- Presumptive-S
'I presume Kim was tired yesterday / Probably Kim was tired yesterday.'

[21] Here we need to assume a morphological process by which *-nun* is deleted when *-keyss* is attached to a verb.

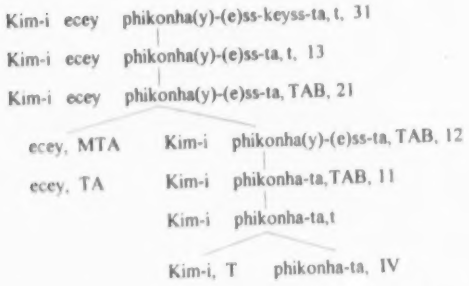
[22] Kratzer defined six modal notions, which depend on conversational backgrounds. I will omit the definitions here, but each modal notion is related to a modal expression in English in the following way.

necessity *must*
weak necessity *probably*
good possibility *there is a good possibility that*
possibility *might*
slight possibility *there is slight possibility that*
better possibility *is more likely than*

[23] Though I will not discuss the volitional *-keyss* in detail, I conjecture that the interpretation of sentences with volitional *-keyss* could be derived by applying the same rule (S 31) and by assuming another modal operator '$\Box_{volit}$' which represent the speaker's volition about the sentence.

[24] p is a variable of type <s, t>

(56) a



b $\Box_{presum}\ \exists t$ [yesterday'(t) & [**compl**(t) & AT(t, be-tired'(k))]]

5. Implications on tense-aspect system

In the previous sections, I presented truth-conditional interpretations (along with pragmatic conditions) of *-ess* and *-(nu)n*/-ϕ sentences, in terms of completive intervals and incompletive intervals. The reason that I employed the terminology 'completive' and 'incompletive' was to convey the distinction in (29), i.e., the distinction based on whether a described eventuality is completed (or terminated) by the speech time. This terminology may be misleading, however, since the terms are traditionally used for aspectual categories.

Now, given the analysis of *-ess* and *-(nu)n*/-ϕ sentences it would be worth considering what this analysis implies about the tense/aspect system in Korean. As background for this discussion, I need to mention the commonly assumed distinction between tense and aspect.

Tense establishes the temporal location of eventuality with respect to some time. Thus according to Comrie (1976:1-2) 'tense relates the time of the situation referred to some other time, usually to the moment of speaking'. On the other hand, aspect does not involve a relation to the speech time, and Comrie explains that 'aspects are different ways of viewing the internal temporal constituency of a situation'. The most common categories of tense are, of course, past, present, and future (or past and nonpast), and the most common aspectual categories are perfective and imperfective.

The terms 'completive' and 'incompletive' themselves are aspectual, since they represent the perfective/imperfective distinction with respect to the temporal dimension in Lee's (1991) terms. Lee (1991) summarizes three views of perfectivity: (i) the temporal view, (ii) the totality view, and (iii) the view of boundness. The temporal view of perfectivity considers a situation in terms of its completion. Perfectivity in terms of completion is concerned with the temporal dimension of a situation, because it has to do with which temporal juncture - e.g. beginning, middle, or end - of the situation is focused on. (Lee, 1991:43)

The totality view, on the other hand, looks at situation in terms of its entirety. Thus perfectivity is determined by whether the situation is viewed internally (imperfective) or the whole situation is viewed in its entirety as an unanalyzable unit (perfective). Comrie's (1976) distinction between perfective and imperfective makes reference to totality, since Comrie argues that perfective denotes a complete situation, with beginning, middle, and end, whereas imperfective describes internal temporal structure.

The third view, the view of boundness is concerned with whether a situation is limited in some ways: e.g. by initial or terminal juncture, by being wrapped up as a whole, or having an inherent end-point (Lee: 58).[25]

Now, if we consider the terms 'completive' and 'incompletive' employed in this paper, in terms of Lee's distinction, this approach can be categorized as the temporal view of perfectivity, since the completion of a situation is considered as in (29).

However, despite the aspectual connotation that the terms 'completive' and 'incompletive' carry, it should be noted that the interpretation of *-ess* and *-(nu)n*/-ϕ in terms of completive and incompletive intervals do not argue that *-ess* and *-(nu)n*/-ϕ are a completive and incompletive aspect marker, respectively. Rather, the truth-conditional meanings that are assigned to *-ess* and *-(nu)n*/-ϕ sentences in section 2 and section 3 do not reflect such an aspectual distinction directly. (10), (32) along with the rules (15), and (42) indicate that the basic distinction between *-ess* and *-(nu)n*/-ϕ lies on tense rather than on aspect, because *-ess* or *-(nu)n*/-ϕ locates a situation with respect to a completive or incompletive interval which makes reference to some other interval (usually speech time).

On the other hand, the aspectual meaning generally associated with *-ess*/*-(nu)n* is explained as well, though not truth-conditionally. The 'completive' (or 'perfective') meaning of *-ess* sentences is achieved by the conversational implicature discussed in section 3.1, together with the notion of completive interval in (10), and the rule (15). As *-ess* sentences are located in a completive interval i by (15), and it is conversationally implicated that the situation does not extend beyond i, *-ess* sentences will have 'completive' (or 'perfective') meaning in ordinary contexts. As for the *-ess* sentences with telic predicates, the telicity condition in (12) as well plays a role in assigning 'completive' (or perfective') meaning, since a telic situation which is located in a completive interval cannot extend to some future time, due to the condition that telic sentences have a unique interval for which they are true. In the same way, the 'incompletive' (or 'imperfective') meaning of *-(nu)n*/-ϕ sentences arises from a conversational implicature along with the concept of incompletive interval in (32) and the rule (42). That is, by employing *-(nu)n*/-ϕ rather than *-ess*, it is implicated that the situation involved is not completed yet.

To sum up, in the present analysis, *-ess* and *-(nu)n* -ϕ are viewed as conveying both tense and aspect meaning, though only the former is truth-conditional.

[25]Despite the conceptual difference among these three views of perfectivity, however, Lee notes that they are also related to each other, and that some authors such as Dahl (1985) consider perfective as having all of the three features.

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Interpretation of Relative Tenses in Korean Time Adverbials*

Jae-Hak Yoon

1 Introduction

Korean is a relative tense language in the sense that the tense may inherit its locus from a point other than the moment of speech. For instance in a complement clause, the same form *Mary-ka ttena-ess* in (1) - (3) refers to different times depending on the clause into which it is embedded: it refers to some time in the past prior to the time of John's feeling in (1), some time in the past in (2), and some time in the future in (3).[1]

(1) John-un Mary-ka ttena-ess-tako nukki-ess-ta.
John-Top Mary-Nom leave-Compl-Comp feel-Compl-Dec
'John felt that Mary had left.'

(2) John-un Mary-ka ttena-ess-tako nukki-nun-ta.
John-Top Mary-Nom leave-Compl-Comp feel-Incom-Dec
'John feels that Mary left/has left.'

(3) John-un nayil Mary-ka ttena-ess-tako nukki-keyss-ta.
John-Top tomorrow Mary-Nom leave-Compl-Comp feel-Fut-Dec
'John will feel tomorrow that Mary has left.'

* I wish to thank Craige Roberts for many valuable comments that have shaped this paper in a large part. Also I thank David Dowty, Carl Pollard, Eun Jung Yoo, and Andreas Kathol, for discussions and comments. All errors are of course mine.

[1] I will use the following abbreviations, anticipating the definitions of 'completive' and 'incompletive' in § 2.1:
Top: topic marker, Nom: nominative marker, Acc: accusative marker, Comp: complementizer, Rel: relativizer, Hon: honorific, Dec: declarative mood marker, Fut: future tensemarker, Compl: completive marker, Incom: incompletive marker.

Moreover, I will ignore most phonologically based variations of orthography in romanizations, hoping this way to facilitate understanding of the data presented for nonnative speakers of Korean.

A similar kind of relativity is found in complex time adverbials as in (4) and (5). The same temporal adverbial expression refers to a past time in (4) and to a future time in (5):

(4) Mary-ka tochakha-ϕ-ul ttay John-i ttena-ess-ta.
Mary-Nom arrive-Incom-Rel time John-Nom leave-Compl-Dec
'John left when Mary was arriving.'

(5) Mary-ka tochakha-ϕ-ul ttay John-i ttena-kyess-ta.
Mary-Nom arrive-Incom-Rel time John-Nom leave-Fut-Dec
'John will leave when Mary is arriving.'

While most time adverbials in Korean show this relativity in tense, there are several non-trivial points that distinguish time adverbials from complement clauses. First, comparing (1) and (6) below, we notice that they are not completely parallel in relativity. Both sentences have the completive tense in the matrix and the embedded clauses. Nevertheless, the event time of the time adverbial in (6) has to be 'immediately' before the event time of the matrix, whereas (1) follows the regular pattern of relativity so that the event time of the embedded clause is 'completive' relative to the event time of the matrix, i.e. roughly the former is prior to the latter.

(1) John-un Mary-ka ttena-ess-tako nukki-ess-ta.
John-Top Mary-Nom leave-Compl-Comp feel-Compl-Dec
'John felt that Mary had left.' (leaving time < feeling time)

(6) Mary-ka tochakha-ess-ul ttay John-i ttena-ess-ta.
Mary-Nom arrive-Compl-Rel time John-Nom leave-Compl-Dec
'John left when Mary had arrived.'
(arriving time is immediately before leaving time)

Secondly, the difference in tense is neutralized when an atelic predicate appears in a time adverbial. For instance, a distinction does not arise between (7) and (8). (8) means the same as (7) even though (7) and (8) have different tenses, viz. incompletive and completive, respectively:

(7) Mary-ka aphu-ϕ-ul ttay John-i ttena-ess-ta.
Mary-Nom sick-Incom-Rel time John-Nom leave-Compl-Dec
'John left when Mary was sick.' (leaving time ⊆ sick time)

(8) Mary-ka aphu-ess-ul ttay John-i ttena-ess-ta.
Mary-Nom sick-Compl-Rel time John-Nom leave-Compl-Dec
'John left when Mary was sick.' (leaving time ⊆ sick time)

Thirdly, the event time of a time adverbial does not shift when a stative predicate appears in the matrix sentence: the event time of the time adverbial in (9) is understood as the same time as the event time of the matrix.[7]

(9) Apeci-ka tola ka-si-ess-ul ttay John-i tases-sal-i-ess-ta.
Father-Nom back go-Hon-Compl-Rel time John-Nom five-age-is-Compl-Dec
'John was five when Father passed away.' (dying time ⊆ time of being five)

[7] It seems that judgements are split about activity predicates while almost all speakers agree that the distinctions in tense are neutralized for statives in (7), (8), and (9), many speakers do not agree that it is also true for activity predicates. But the neutralization tends to occur more readily with an activity predicate with a typically longer duration. For example, *cta* 'to sleep' and *hakkyo-ey-kokalo kele-ka* 'to walk towards the school' seem more likely to be neutralized in tense than *kongwon-eyse sanchayskha* 'to take a walk in the park' or *kongpwuha* 'to study'.

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Thus, we are apparently left with a non-homogeneous system of relative tense. A complement clause displays complete relativity, whereas a time adverbial shows partial relativity.

This paper is an attempt to give an adequate analysis of time adverbials in Korean, explaining why they exhibit the differences in relativity. Eventually, I will claim that the relativity in tense is consistent with the apparent differences.

2 Korean Data

2.1 Tenses in Korean

In this subsection, I will give a brief overview of the tense system in Korean for a better understanding of the discussion that will follow.

First of all, it has been noted by many that so called 'past tense marker' *-ess* does not directly correspond to the English past tense marker *-ed*. The marker *-ess* in (10) seems to have a function for which English would make use of two different expressions: *-ed* and *have -ed*.

(10) a. Ecey pi-ka nayli-ess-ta.
yesterday rain-Nom come.down-Compl-Dec
'It rained yesterday.'

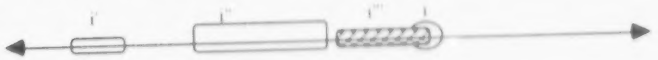
b. Ku yeca-ka caknyen-pwuthe an o-ess-ta.
that woman-Nom last.year-from not come-Compl-Dec
'The woman hasn't come since last year.'

As is indicated in the English glosses, the marker *-ess* in (10a) is best translated as a past tense marker, whereas the one in (10b) is translated as perfect tense. Since one form apparently functions in two different ways, there are at least four possible analyses. One analysis is that the basic function of *-ess* is to mark past tense and that the perfective meaning as in (10b) derives from the basic meaning. This position is held by Martin (1954), Choe (1977), An (1980), K-D. Lee (1981), and C. Lee (1987). Another analysis goes the other way, assuming that the perfective meaning is basic. This is supported by Huh (1983), Sohn (1975), and Nam (1978). Shin (1988) and S-K. Lee (1988) propose that there are two kinds of *-ess*, the past tense marker *-ess* and the perfective aspect marker *-ess*. Recently some authors proposed that *-ess* has only one meaning, which is indeterminate between past and perfect readings by itself, though further specifications can be provided by contexts and/or time adverbials. This kind of analysis has been proposed by S-H. Choi (1987), H.S. Lee (1991), H-W. Choi (1993), and Yoo (1993).

I will follow Yoo (1993, 1996) in assuming that *-ess* marks what Stump (1985) calls 'a perfect interval', as the definition and some examples of the members are given in (11) and (12). This move is obviously to adopt an approach which views *-ess* as having one interpretation.

(11) **compl**(ζ) is true at i
iff i' begins before i and lasts no later than i, where ζ denotes i'.

(12) i', i'', and i''' are completive intervals relative to i.



Another issue to be settled is concerned with the morpheme *-nun*, frequently considered as the present tense marker. (13) below shows that *-nun* appear only in a non-past sentence. It is also shown in (12) that it cannot appear with a class of verbs which were traditionally called adjectives but are now called more commonly description verbs or adjectival verbs. The class of these verbs coincides with that of adjectives in English. Without further discussion, I will follow Yoo (1993, 1996) in assuming that *-nun* is required for incompleteness of an event with respect to some time as shown in (14) and (15) and moreover that this is realized as a zero morpheme in adjectival verbs as in (16a).

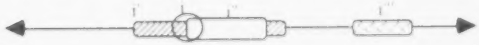
(13) a. Mary-ka nayil hakkyo-ey ka-nun-ta.
Mary-Nom tomorrow school-to go-Incom-Dec
'Mary goes to school tomorrow.'

b. Mary-ka hakkyo-ey ka-nun-ta.
Mary-Nom school-to go-Incom-Dec
'Mary goes to school/ Mary is going to school.'

c. *Mary-ka ecey hakkyo-ey ka-nun-ta.
Mary-Nom yesterday school-to go-Incom-Dec
(int.)'Chelwu went to school yesterday.'

(14) **incom**(ζ) is true at t
iff i' lasts later than t, where ζ denotes i'.

(15) *i', i'', and i'''* are incompletive intervals relative to t.



(16) a. Mary-ka yeppu-ϕ-ta.
Mary-Nom is.pretty-Incom-Dec
'Mary is pretty.'

b. *Mary-ka yeppu-nun-ta.
Mary-Nom is.pretty-Incom-ta
(int.)'Mary is pretty.'

One critical aspect of Korean is that the tenses are all relative. That is, a tense in an embedded clause is evaluated not by the speech time but by the event time of the next higher clause. When there is no next higher clause, i.e., when the tense is in the matrix clause, it is evaluated with respect to the speech time. Then, one implication is that Korean cannot have so-called 'double accessability readings' (cf. Abusch 1988 and Enç 1987). In English a sentence like (17a) is claimed to have a double accessability reading in that Mary was pregnant at the time of John's saying and moreover that Mary is pregnant at the speech time. However, since every tense is relative to its next higher clause in Korean, it is predicted that there is no double accessability reading in (17b). (17b) can only mean that Mary was pregnant at the time of John's saying.

(17) a. John said that Mary is pregnant.

b. John-nun Mary-ka imsincwung-i-ϕ-lako malha-ess-ta.
John-Top Mary-Nom pregnant-is-Incom-Comp say-Compl-Dec
'John said that Mary was pregnant.'

2.2 Structure of Time Adverbials

The canonical structure of Korean time adverbials consists of an NP plus a postposition. A postposition is necessary in most cases, e.g. *caknyen-ey* 'last year'. There are a few time adverbials in which a postposition is optional, e.g. *ku ttay-(ey)* 'at that time', or not possible, e.g. *ecey* 'yesterday'. Where a subordinating conjunction is commonly employed in other languages as in (18), an NP with a relative clause is used in Korean. This use of relative clause constructions for time adverbials, it is reported, is also exhibited by Hausa, Mandarin, Swahili, Hungarian, Turkish, etc. (cf. Thompson and Longacre 1985).

(18) John left when Mary was arriving.

(4) Mary-ka tochakha-φ-ul-ttay-(ey) John-i ttena-ess-ta.
Mary-Nom arrive-Incom-Rel-time-at John-Nom leave-Compl-Dec
'John left when Mary was arriving.'

Since the construction of the time adverbial in (4) is based on a relative clause, it would be more faithful to gloss it as 'John left at the time when Mary was arriving'. However, (18) seems to be a more natural expression in English and I do not find difference in meaning, so I will continue to gloss in this way.

There are two sets of tense inflections in Korean: one for independent clauses, another for relative clauses. Comparing two kinds of corresponding clauses in (19) and (20), we can represent the inflectional patterns as (21) below.

(19) a. Chinkwu-ka ecey ttena-ess-ta.
friend-Nom yesterday leave-Compl-Dec
'A friend left yesterday.'

b. Chinkwu-ka ttena-nun-ta.
friend-Nom leave-Incom-Dec
'A friend leaves/A friend will leave.'

c. Chinkwu-ka nayil ttena-kyess-ta.
friend-Nom tomorrow leave-Fut-Dec
'A friend will leave tomorrow.'

(20) a. ecey ttena-φ-un chinkwu
yesterday leave-Compl-Rel friend
'a/the friend who left yesterday'

b. ttena-nu-un chinkwu
leave-Incom-Rel friend
'a/the friend who leaves/will leave'

c. nayil ttena-ulchinkwu
tomorrow leave-Rel friend
'a/the friend who will leave tomorrow'

(21) Tense Markers in Korean

a. Independent Clauses:

		non-adjectival verbs	adjectival verbs
realis	completive	-ess	-ess
	incompletive	-nun	-ϕ
irrealis	future	-keyss	-keyss

b. Relative Clauses:

		non-adjectival verbs	adjectival verbs
realis	completive	-ϕ + un(REL)	
	incompletive	-nu + un(REL)	-ϕ + un(REL)
irrealis	future	-ul(REL)	-ul(REL)

However, the *-ul ttay* 'when' time adverbial is an exception to the regular pattern of relative clause inflections in (21b). The pattern for the *-ul ttay* time adverbial is given in (22). Notice that there is no irrealis relativizer with this construction. But once we consider the nature of time adverbials, it is hardly surprising. It has been claimed that time adverbial clauses have factive presuppositions (see Heinamaki 1974). Thus, this lack of irrealis reading is expected. What is unexpected, though, is the use of the relativizer *-ul*. It is used as the irrealis relativizer in the regular pattern. It is unknown why the regular *-un* relativizer is not used for this construction.

(22) Relative Clauses for *-ul ttay* 'when'

		all verbs
realis	completive	ess + ul(REL)
	incompletive	-ϕ + ul(REL)
irrealis	future	

Other time adverbials follow the regular pattern in (21b), e.g. *hwu* 'after' and *ci* 'since'. It is observed that the *hwu* 'after' complex takes only the completive tense:

(23) Mary-ka tochakha-ϕ-un hwu-ey John-i ttena-ess-ta.
Mary-Nom arrive-Compl-Rel later.time-at John-Nom leave-Compl-Dec
'John left after Mary arrived.'

(24) *Mary-ka tochakha-nu-un hwu John-i ttena-ess-ta.
Mary-Nom arrive-Incom-Rel later.time John-Nom leave-Compl-Dec
(int.) John left after Mary was arriving.'

(25) *Mary-ka tochakha-ul hwu John-i ttena-ess-ta.
Mary-Nom arrive-Rel later.time John-Nom leave-Compl-Dec
(int.) John left after Mary would arrive.'

The unacceptability of (25) is due to the same reason that accounts for why the adverbial cannot have the irrealis relativizer. Namely, the factive presupposition in time adverbials is incompatible with the presuppositions triggered by irrealis inflections. I will show in Section 3 that (24) is bad on semantic grounds.

3 Semantic Analysis

Given the data displaying nonhomogenous relativity in time adverbials, I will show how they are predicted to yield the readings in § 2. I will draw on Stump's (1985) work as for the general basis of the formal framework. I also follow Yoo (1993, 1996) on the semantics of the completive and incompletive tenses.

3.1 Preliminaries

A category 'temporal abstract' is useful, as Stump proposes in part to account for iterated time adverbials as separate constituents. With this category Stump views a sentence also as denoting a set of times at which the corrresponding proposition is true. As a first step I will adopt this category and the rules involving the category. The temporal abstract rule in (26) yields temporal abstracts from a sentence. The main tense adverb rule in (27) modifies a given temporal abstract, yielding yet another temporal abstract, thus making it possible to recursively apply the rule. Then, the existential closure rule in (28) reverses the temporal abstract rule and provides an existential quantifier over times, yielding the final translation of a sentence:

(26) Temporal Abstract Rule (Stump 1985:105):
S11. If $\phi \in P_t$[-tense], then $F_{11}(\phi) \in P_{TAB}$[-tense], where is $F_{11}(\phi)$ is ϕ.
T11. If $\phi \in P_t$ and ϕ translates as ϕ', then $F_{11}(\phi)$ translates as $\lambda t[AT(t, \phi')]$.

(27) Main Tense Adverb Rule (Stump 1985:119):
S12. If $\alpha \in P_{MTA}$ and $\beta \in P_{TAB}$, then $F_{12}(\alpha,\beta) \in P_{TAB}$.
where is $F_{12}(\alpha,\beta)$ is $\alpha\beta$.
T12. functional application.

(28) Existential Closure (Stump 1985:107):
S13. If $\alpha \in P_{TAB}$[+tense], then $F_{13}(\alpha) \in P_t$[+tense], where is $F_{13}(\alpha)$ is α.
T13. If $\alpha \in P_{TAB}$ and α translates as α', then $F_{13}(\alpha)$ translates as $\exists t[\alpha'(t)]$.

Also, the AT operator will be adopted:

(29) Operator **AT** (Dowty (1979))
$AT(t_1, \phi)$ is true at any time t iff ϕ is true at the time denoted by t_1.

The model for the intensional logic is a sextuple including the precedence relation and the subinterval relation on the set of times. The overlap relation can be derived from the subinterval relation such that $t \bullet t'$ iff there is t" such that $t'' \subseteq t$ and $t'' \subseteq t'$:

(30) Model M for IL = <A, W, T, <, $\subseteq$, F>
A, the set of individuals
W, the set of worlds
T, the set of times (intervals)
<, the precedence relation on T
$\subseteq$, the subinterval relation on T
F, the interpretation function
($\bullet$, the overlap relation on T)

I specify variable conventions in (31) which are in accord with Dowty (1979) and Stump (1985). The categories and their types in (32) mostly follow Stump except that I propose a

new category POST(position) whose expressions include *ey* 'at'. An expression of POST combines with an expression of TA, resulting in a MTA. A MTA in turn combines with a TAB, yielding another TAB.

(31) Variable Conventions

a. $t, t_0, t_1, t_2, t', t''$ are variables of type i.
b. x, y, z are variables of type e.
c. P and Q are variables of type <s,<e,t>>.
d. P^0 and Q^0 are variables of type <s,<i,t>>.

(32) Categories and Types:

Syntactic Categories	Types	Basic Expressions
CN	<e,t>	salam 'person', ...
TA	<i,t>	caknyen 'last year', ...
IV	<e,t>	aphu 'to be sick', ...
T	<<s,<e,t>>,t>	John, Mary, ...
TV	<<s,f(T)>,f(IV)>	chach 'to seek', ...
t	t	Λ
TAB	<i,t>	Λ
MTA	<<s,f(TAB)>,<i,t>>	Λ
POST	<<s,f(TA)>,f(MTA)>	ey 'at'

As mentioned earlier, I adopt Yoo's proposal for the completive and the incompletive tenses. The tense rules in (33) and (34) introduce two intensional logic predicates, **compl** and **incom**. Their truth conditions are defined in (11) and (14) above.

(33) Completive Rule (Yoo 1993:387)

S14. If $\alpha \in P_{TAB}$[-tense], then $F_{14}(\alpha) \in P_t$[+tense], where is $F_{14}(\alpha)$ is the result of placing *-ess* in the predicate of α.

T14. If $\alpha \in P_{TAB}$ and α translates as α',
then $F_{14}(\alpha)$ translates as λt[compl(t) & α'(t)].

(34) Incompletive Rule (Yoo 1993:388)

S15. If $\alpha \in P_{TAB}$[-tense], then $F_{15}(\alpha) \in P_t$[+tense],
where $F_{15a}(\alpha)$ is α when it is an adjectival verb,
$F_{15b}(\alpha)$ is the result of placing *-nun* in the predicate of α, otherwise.

T15. If $\alpha \in P_{TAB}$ and α translates as α',
then $F_{15}(\alpha)$ translates as λt[incom(t) & α'(t)].

3.2 Analysis

Given the rules in the preceding section, I will illustrate the derivational steps of a sentence with a simple time adverb, to give the flavor of the system that I am employing here. Incidentally, we need one more rule in the derivation which will enable a postposition to combine with a time adverbial and then to take a temporal abstract as an argument. The rule is given in (35):

(35) Postposition Rule:

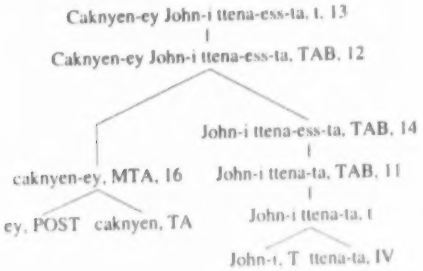
S16. If $\alpha \in P_{POST}$ and $\beta \in P_{TA}$, then $F_{16}(\alpha,\beta) \in P_{MTA}$, where is $F_{16}(\alpha,\beta)$ is $\beta\alpha$.

T16. Functional application.

With the addition of the postposition rule, we can derive the sentence (36) as (36'). The corresponding semantic derivation is given (36") below:

(36) Caknyen-ey John-i ttena-ess-ta.
last.year-at John-Nom leave-Compl-Dec
'John left last year.'

(36')



(36") caknyen 'last year', TA=> $\lambda t_1[t_1 \subseteq$ **last-year**$]$, **last-year** is an interval constant
ey 'at', POST => $\lambda P^1\lambda Q^1\lambda t[Q^1\{t\}$ & AT(t, $P^1\{t\})]$
caknyen-ey, MTA => $\lambda Q^1\lambda t[Q^1\{t\}$ & AT(t, t $\subseteq$ **last-year** $)]$
John-i ttena-ta, TAB => $\lambda t_0[$ AT(t_0, leave'(j))$]$
John-i ttena-ess-ta, TAB => $\lambda t_0[$compl(t_0) & AT(t_0, leave'(j))$]$
Caknyen-ey John-i ttena-ess-ta, TAB
=> $\lambda t[$compl(t) & AT(t, leave'(j)) & AT(t, t $\subseteq$ **last-year** $)]$
Caknyen-ey John-i ttena-ess-ta, t
=> $\exists t[$compl(t) & AT(t, leave'(j)) & AT(t, t $\subseteq$ **last-year** $)]$, $\exists$ -Closure

The denotation of the postposition may look unnecessarily complex for the derivation of (36). We might as well propose (37) as its denotation with which we will arrive at (38) as (36") and (38) are equivalent.

(37) ey 'at', POST => $\lambda P^1\lambda Q^1\lambda t[Q^1\{t\}$ & $P^1\{t\}]$
(38) Caknyen-ey John-i ttena-ess-ta, t
=> $\exists t[$compl(t) & AT(t, leave'(j)) & t $\subseteq$ **last-year** $]$

However, the more complex kind of denotation in (36") is needed to give a unified account when the postposition combines with a complex TA which has tense specifications, i.e. to capture the relativity of the tense in complex temporal adverbials.

3.2.1 Complement Clauses

The relativity of tense can be captured with ease when we assume that all tenses are relative and use the AT operator. We can derive (1) below with an additional rule which will

combine a transitive verb and a complement clause. I will omit the rule, as it is obvious. Assuming this rule, we will arrive at the translation in (1') for (1):

(1) John-un Mary-ka ttena-ess-tako nukki-ess-ta.
John-Top Mary-Nom leave-Compl-Comp feel-Compl-Dec
'John felt that Mary had left.' (time of leaving < time of feeling)

(1') $\exists t_0[\text{compl}(t_0)\ \&\ \text{AT}(t_0, \text{feel}'(j, \hat{}\exists t_1\ [\text{compl}(t_1)\ \&\ \text{AT}(t_1, \text{leave}'(m))])]$

Notice that in (1') the interval variable t_1 is in the scope of t_0, thus the former is relative to the latter by the function of the AT operator. However, I should point out that contrary to common assumptions (cf. Stump 1985:124--125, Ogihara 1992:135), this scope analysis in the current form works only if we consider a proposition simply as a set of worlds, rather than a set of world-time pairs. If we assume that a proposition is a set of indices like as in PTQ, the formula $\exists t_1$ [compl(t_1) & AT(t_1, leave'(m))] ends up being independent of the event time of the matrix clause. See Yoon (1996, Chapter 5), where I explore a way to capture the relativity of tense but still treating propositions as sets of indices.

3.2.2 Relative Clauses

Relative clauses are crucially distinguished from complement clauses in that tenses within relative clauses can be independent of those in their higher clauses. A sentence like (39) has two readings as indicated. The two readings can be described in theoretical terms by saying that the incompletive tense of the relative clause is relative to the matrix event in the (a) reading but to the speech time in the (b) reading.

(39) John-i Seoul-ey ka-nu-un salam-ul chach-ess-ta.
John-Nom Seoul-to go-Incom-Rel person-Acc seek-Compl-Dec
a. 'John sought a person who was going to Seoul.'
b. 'John sought a person who is going to Seoul.'

These two kinds of readings for a sentence like (39) are commonly differentiated as *de dicto* and *de re*: (39a), a *de dicto* reading in which John sought whoever meets the description, and (39b), a *de re* reading in which John sought a certain person and the description for the person is given by the speaker.

What is crucial in a relative clause construction is the fact that the *de re* vs. *de dicto* distinction is correlated with the relativity of tense in the clause, as observed in Kang (1988) as well. Thus, if a relative clause receives a de dicto interpretation, the tense in the relative clause is relative to the event time of its immediately higher clause. Conversely, if a relative clause is interpreted as *de re*, its tense is relative to the speech time. For example, in the *de dicto* reading of (39), glossed as (39a), the time of going to Seoul is incompletive relative to the time of seeking. Therefore, the time of going to Seoul can be before the speech time in this reading (but also can be after the speech time). On the other hand, the time of going to Seoul is incompletive relative to the speech time in the *de re* reading of (39), glossed in (39b). Hence, the time of going to Seoul cannot be prior to the speech time. In this case the tenses are independent of each other.

Most approaches handle the *de re* vs. *de dicto* distinction by resorting to scopal differences between the readings, cf. the Quantifying-In rule in PTQ or its variants, Quantifier Store (cf. Cooper 1975), Quantifier Raising, etc. Thus, as Ladusaw (1977) does for English tense, it seems a natural move to propose a quantification rule of some sort in order to account this. In fact, Kang (1988) proposes Quantifier Store and Park and Han (1993) suggest a Quantifier Raising approach for Korean in this regard.

Let us assume a standard Quantifier Storage system of Cooper (1975), in which quantificational NPs are stored to be retrieved later in the derivation. The truth conditions in (40a) are obtained when the denotation of the object NP is directly applied to the denotation of the verb *chach-ess-ta* at that level. On the other hand, if we retrieve the object NP denotation at the sentential level, we will get (40b). Note that in (40a) the formula *incom*(t_1) reflects the fact that the time of going to Seoul t_1 is incompletive relative to the time of seeking t_0. In (40b) the time t_1 is specified to be incompletive relative to the speech time. Thus, the facts in relative clauses are adequately captured under our analysis.

(40) a. $\exists t_0$[compl(t_0) & AT(t_0, seek'(j, ^λQ$\exists$x[person'(x) &
$\exists t_1$[incom(t_1) & AT(t_1, go-to-Seoul'(x))] & Q{x}])]

(de dicto)

b. $\exists$x[person'(x) & $\exists t_1$[incom(t_1) & AT(t_1, go-to-Seoul'(x)) &
$\exists t_0$[compl(t_0) & AT(t_0, seek'*(j, x))]]]

(de re)

3.2.3 Time Adverbials

Let us now proceed to treatment of time adverbials, our main topic in this paper. Recall that the canonical structure of a complex time adverbial is based on the relative clause construction. In (41) I propose denotations for the head nouns in the construction. Thus, the meaning of *hwu* 'afterward' is a set of times which are later than some specific time. Likewise, the meaning of *ttay* 'time' is a set of times which are about the same time as some specific time. Notice that each denotation contains a free variable.

(41) a. hwu 'afterward', CN => $\lambda t[t_0 < t]$

b. ttay 'time', CN => $\lambda t[t = t_0]$ [1]

N.B. t_0 is a free variable.

c. = is defined such that

---

[1] David Dowty pointed out that the denotations for *ttay* 'time' here and *ey* 'at' as proposed in (36") above are unintuitive. His objection is based on the observation that (a) *ttay* 'time' in itself does not have anything which amounts to the sense of proximity which is represented by =, and (b) *ey* 'at' should provide this meaning of proximity, instead, considering that *ey* 'at' is also used to indicate proximity of spatial locations to events.

I agree with Dowty in these regards. Accommodating his observation, we could propose alternative denotations as in (i) and (ii):

(i) ttay 'time' => time'

(ii) ey 'at' => $\lambda P^t\lambda Q^t\lambda t[Q^t\{t\}$ & AT(t, $\exists t_1[P^t\{t_1\}$ & t = $t_1]]$)]

These alternatives should cover the same range of data and make the same predictions as the ones proposed in the text. Therefore, these should be preferred on the theoretical ground. After all, they are more intuitive and consistent with the lexical items' behaviors in other environments.

Adopting these alternatives in deriving (23), we will get (iii) as the truth condition of (23), whereas (23') will be derived according to the current denotations in the text, as we will see shortly.

(iii) $\exists t$[compl(t) & AT(t, leave'(j)) &
AT(t, $\exists t_2$[$\exists t_0$[$t_0 < t_2$ & compl(t_0) & AT(t_0, arrive'(m))] & t = t_2])]

(23') $\exists t$[compl(t) & AT(t, leave'(j)) & AT(t, $\exists t_2$[$t_2 <$ t & compl(t_2) & AT(t_2, arrive'(m))])]

If we compare (iii) with (23'), we find the latter much more perspicuous than the former. Thus, I will keep the denotations as they are, mainly for expository purposes; they should be understood as abbreviations for the alternatives in (i) and (ii).

$t \approx t'$ iff i) $t \bullet t'$ or
ii) they are immediately adjacent (i.e. no interval between them)

The definition of '≈' follows in spirit Stump's (1985) *when* in English in the sense that the relation indicates 'about the same time' rather than 'exactly the same time'. I will assume without discussion that a relative clause specifies the free variables in the head noun, e.g. t_0 in (41a,b), thus indirectly constraining the set of times its head noun denotes. More specifically, I assume the approach I proposed in Yoon (1993) in allowing the relativizer *-un* and *-ul* to make certain that the free variable is coindexed with the variable of which the relative clause is predicative. For example, the head noun *hwu* 'afterward' combines with a TAB (42) below by way of the relativizer *-un*, resulting in (43a). In (43a) below there is no free variable. We get complex time adverbials like (43b) and (43c) in the same manner:

(42) Mary-ka tochakha-ϕ 'Mary arrived', TAB => λt_1[compl(t_1) & AT(t_1, arrive'(m))]

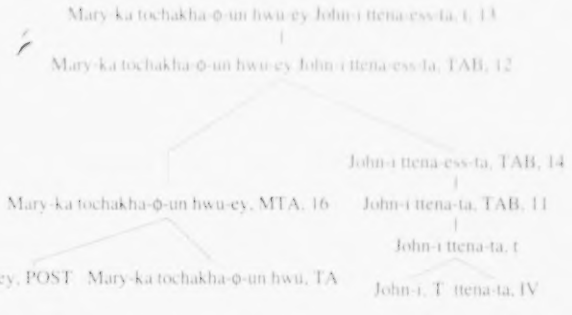
(43) a. Mary-ka tochakha-ϕ-un hwu 'a time after Mary arrived'
=> $\lambda t_1 \exists t[t < t_1$ & compl(t) & AT(t, arrive'(m))]
b. Mary-ka tochakha-ess ul ttay 'the time when Mary arrived'
=> $\lambda t_1 \exists t[t_1 = t$ & compl(t) & AT(t, arrive'(m))]
c. Mary-ka tochakha-ul ttay 'the time when Mary is arriving/arrives'
=> $\lambda t_1 \exists t[t_1 = t$ & incom(t) & AT(t, arrive'(m))]

Now we are in a position to give a derivation for a sentence with a complex time adverbial like (23), repeated here. Once we make the above assumptions, the derivational steps are essentially the same as the ones with simple time adverbials as in (36) above.

(23) Mary-ka tochakha-ϕ-un hwu-ey John-i ttena-ess-ta
Mary-Nom arrive-Compl-Rel afterward-at John-Nom leave-Compl-Dec
'John left after Mary arrived.'

The syntactic and the semantic derivations are given in (23') and (23''), respectively.

(23')


Mary-ka tochakha-ϕ-un hwu-ey John-i ttena-ess-ta, t, 13
Mary-ka tochakha-ϕ-un hwu-ey John-i ttena-ess-ta, TAB, 12
John-i ttena-ess-ta, TAB, 14
Mary-ka tochakha-ϕ-un hwu-ey, MTA, 16
John-i ttena-ta, TAB, 11
John-i ttena-ta, t
ey, POST Mary-ka tochakha-ϕ-un hwu, TA
John-i, T ttena-ta, IV

(23'')
Mary-ka tochakha un hwu, TA => $\lambda t_1 \exists t[t < t_1$ & compl(t) & AT(t, arrive'(m))]
Mary-ka tochakha un hwu-ey, MTA

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=> $\lambda Q^t \lambda t[Q^t(t) \& AT(t, \exists t_2 [t_2 < t \& compl(t_2) \& AT(t_2, arrive'(m))])]$

John-i ttena-ess-ta, TAB => $\lambda t_0[compl(t_0) \& AT(t_0, leave'(j))]$

Mary-ka tochakha un hwu-ey John-i ttena-ess-ta, TAB

=> $\lambda t[compl(t) \& AT(t, leave'(j)) \&$
$AT(t, \exists t_2[t_2 < t \& compl(t_2) \& AT(t_2, arrive'(m))])]$

Mary-ka tochakha un hwu-ey John-i ttena-ess-ta, t

=> $\exists t[compl(t) \& AT(t, leave'(j)) \&$
$AT(t, \exists t_2 [t_2 < t \& compl(t_2) \& AT(t_2, arrive'(m))])]$

If we consider the final step in (23"), it is easy to see that Mary's arriving time is prior to John's leaving time, as desired.

Recall at this point that the *hwu* 'after' construction allows only the completive tense. Thus, it was observed that (24) repeated below, with the incompletive tense, is unacceptable. Given the rules proposed above, we are able to explain why (24) is unacceptable. Applying almost the same set of rules as in (23'), we get the truth conditions in (24') for (24):

(24) *Mary-ka tochakha-nu-un hwu ey John-i ttena-ess-ta
Mary-Nom arrive-Incom-Rel afterward at John-Nom leave-Compl-Dec
'John left after Mary was arriving.'

(24') $\exists t[compl(t) \& AT(t, leave'(j)) \&$
$AT(t, \exists t_2[t_2 < t \& incom(t_2) \& AT(t_2, arrive'(m))])]$

Then, it is easy to see that (24') is a contradiction: (a) t_2 is incompletive relative to t, thus $\neg(t_2 < t)$ and (b) $t_2 < t$.

Now let us move on to *-ul ttay* 'when' adverbials. By the standard applications of the rules, we will get (4') and (6') as the truth conditions for (4) and (6), respectively:

(4) Mary-ka tochakha-Φ-ul ttay ey John-i ttena-ess-ta
Mary-Nom arrive-Incom-Rel time at John-Nom leave-Compl-Dec
'John left when Mary was arriving'

(4') $\exists t[compl(t) \& AT(t, leave'(j)) \&$
$AT(t, \exists t''[t \approx t'' \& incom(t'') \& AT(t'', arrive'(m))])]$

(6) Mary-ka tochakha-ess-ul ttay (ey) John-i ttena-ess-ta
Mary-Nom arrive-Compl-Rel time at John-Nom leave-Compl-Dec
'John left when Mary had arrived'

(6') $\exists t[compl(t) \& AT(t, leave'(j)) \&$
$AT(t, \exists t''[t \approx t'' \& compl(t'') \& AT(t'', arrive'(m))])]$

As one can easily verify, these truth conditions coincide exactly with the readings we discussed above. Let us first take (4'). We know from (4') that (a) the leaving time t is completive relative to the speech time t', (b) the arriving time t'' is incompletive relative to t, and (c) $t \approx t''$. Thus, it follows from (4') that the leaving time and the arriving time cannot be remotely separated from each other. (4") represents the relations between the times involved in (4) and (4'):

(4")

If we take (6') on the other hand, we know that (a) the leaving time t is completive relative to the speech time t', (b) the arriving time t" is completive relative to t, and (c) t = t". (6") satisfies these conditions. Notice that t" and t are not separated. Moreover, t" is immediately before t in (6"):

(6")

Besides being able to account for most facts about time adverbials, we can also allow time adverbials to iterate, an attractive feature in Stump (1985). We derive (44) as in (44') without an addition of rules. (44") is the derived truth conditions for (44):

(44) Caknyen-ey Mary-ka tochakha-ess-ul ttay ey
last-year-at Mary-Nom arrive-Compl-Rel time at
John-i ttena-ess-ta.
John-Nom leave-Compl-Dec
'Last year John left when Mary had arrived.'

(44')

Caknyen-ey Mary-ka tochakha-ess-ul ttay-ey John-i ttena-ess-ta, t, 13

Caknyen-ey Mary-ka tochakha-ess-ul ttay-ey John-i ttena-ess-ta, TAB, 12

caknyen-ey, MTA, 16 Mary-ka tochakha-ess-ul ttay-ey John-i ttena-ess-ta, TAB, 12

ey, POST caknyen, TA

Mary-ka tochakha-ess-ul ttay-ey, MTA, John-i ttena-ess-ta, TAB

(44") $\exists t[compl(t) \& AT(t, leave'(j)) \&$
$AT(t, \exists t_2[t = t_2 \& compl(t_2) \& AT(t_2, arrive'(m))]) \& AT(t, t \subseteq \textbf{last-year})]$

3.2.4 The Puzzle

While we have been able to account for most of the facts that time adverbials exhibit with respect to the relativity in tense, there still remains a puzzle: why we get no difference in meaning between (7) and (8) below, despite the difference in tense in the temporal adverbials? Moreover, why is this limited only to atelic predicates?

(7) Mary-ka aphu-Ø-ul ttay John-i ttena-ess-ta.
Mary-Nom sick-Incom-Rel time John-Nom leave-Compl-Dec
'John left when Mary was sick.' (leaving time $\subseteq$ sick time)

(8) Mary-ka aphu-ess-ul ttay John-i ttena-ess-ta.
Mary-Nom sick-Compl-Rel time John-Nom leave-Compl-Dec
'John left when Mary was sick.' (leaving time ⊆ sick time)

An essentially same observation was made in S. Choi (1987:51--53) with respect to the connective *taka*. He notes that the presence of the marker *-ess* does not add to the meaning in an atelic clause. Thus, the pairs of sentences in (45) and (46) are understood as the same.

(45) a. Hanul-i malk-ϕ-taka huli-ess-ta.
sky-Nom clean-Incom-Conn cloudy-Compl-Dec
'The sky was clear and then got cloudy.'
b. Hanul-i malk-ess-taka huli-ess-ta.
sky-Nom clean-Compl-Conn cloudy-Compl-Dec

(46) a. Chelswu-ka camsi kitali-ϕ-taka
Chelswu-Nom moment wait-Incom-Conn
swuhwaki-lul noh-ess-ta.
phone-Acc put.down
'Chelswu waited for a while and then hung up the phone.'
b. Chelswu-ka camsi kitali-ϕ-taka
Chelswu-Nom moment wait-Incom-Conn
swuhwaki-lul noh-ess-ta.
phone-Acc put.down

A similar phenomenon has been reported in Japanese too, (cf. Kuno 1973, Soga 1983, Nakazawa 1985). The examples in (47) are from Soga (1983:71) which give the same meaning, even though (47a) and (47b) have different tenses in the temporal adverbial clauses and Japanese tenses are also relative.

(47) a. Kyonen Yokohama-ni iru-toki Tanaka-san-ni awta.
last.year Yokohama-in am-when Mr.Tanaka-Case met
'When I was in Yokohama last year, I met Mr. Tanaka.'
b. Kyonen Yokohama-ni ita-toki Tanaka-san-ni awta.
last.year Yokohama-in was-when Mr.Tanaka-Case met

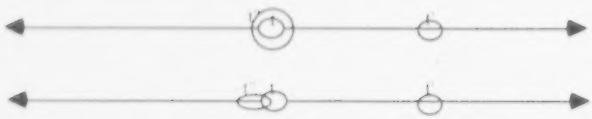
A viable answer can be found when we consider the pragmatics as well as the semantics of the predicates involved. I claim that (7) and (8) are distinct in truth conditions. In Dowty's (1986) words, they are **asserted differently** but **understood as the same**. Thus, my proposal is that they have two different truth conditions (7') and (8'), as our rules will provide:

(7') ∃t[compl(t) & AT(t, leave'(j)) & AT(t, ∃t"[t = t" & incom(t") & AT(t", sick'(m))])]

(8') ∃t[compl(t) & AT(t, leave'(j)) & AT(t, ∃t"[t = t" & compl(t") & AT(t", sick'(m))])]

In (7') and (8') neither entails the other. When we consider the relations between the times, (7") and (8") below satisfy the conditions in (7') and (8'), respectively. The question is why (8") is understood as (7") when the predicate is atelic.

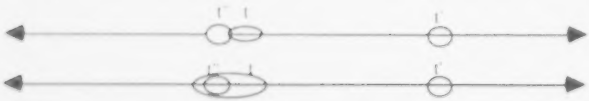
(7') and (8')



Before we make any judgement, let us consider parallel cases in other environments. First, let us take a look at (9), where the matrix predicate is atelic. Suppose in the pictures (9') and (9") below that (a) t' is the speech time, (b) t is the time of being five, and (c) t'' is the dying time. Then, (9') will satisfy the truth condition of (9). However, (9") is what we take (9) to mean.

(9) Apeci-ka tola ka-si-ess-ul ttay John-i tases-sal-i-ess-ta.
Father-Nom back go-Hon-Compl-Rel time John-Nom five-age-is-Compl-Dec
'John was five when Father passed away.' (dying time $\subseteq$ time of being five)

(9') and (9")

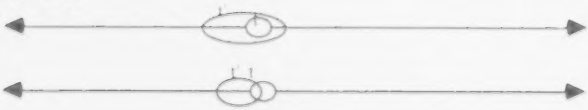


Another parallel case is found in simple sentences like (48) and (49). In these cases we have relations between only two times: the speech time t and the sleeping time t' in (48') and (49'). Given our rules, the truth conditions of (48) and (49) are described correctly by (48') and (49'), respectively. However, both sentences are often understood to describe (48").

(48) Mary-ka achim-pwuthe ca-nun-ta.
Mary-Nom early.morning-from sleep-Incom-Dec
'Mary has been sleeping since early this morning.'

(49) Mary-ka achim-pwuthe ca-ess-ta.
Mary-Nom early.morning-from sleep-Compl-Dec
'Mary has been sleeping since early this morning.'

(48') and (49')



One generalization from the three different sets of data is that the event time of an atelic predicate expands to contain overlapping or adjacent times. Moreover, what is special about complex time adverbials in the *-ul ttay* 'when' construction is that they always provide this kind of environment. Let me also emphasize that this generalization is about only atelic predicates. A natural move, then, seems to look for a clue in the distinction

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between telic and atelic predicates. Let us consider Dowty's summary of the defining criteria of three classes of predicates in (50):

(50) A defining criteria of three aspectual classes of predicates (from Dowty 1986:42):

a. A sentence ϕ is stative iff it follows from the truth of ϕ at an interval i that ϕ is true at all subintervals of i.

b. A sentence ϕ is an activity iff it follows from the truth of ϕ at an interval i that ϕ is true of all subintervals of i down to a certain limit in size.

c. A sentence ϕ is an accomplishment/achievement iff it follows from the truth of ϕ at an interval i that ϕ is false at all subintervals of i.

According to (50), an atelic predicate, i.e. a stative or an activity, is distinguished from a telic predicate in that if an atelic sentence is true at an interval t, it is true of all subintervals of t up to a certain limit in size. Conversely, it follows from (50a,b) that if an atelic sentence is true at t, it can be true at a superinterval of t.

Thus, we now understand why an interval at which an atelic sentence is true has the potential to expand to a superinterval. What we do not understand is why we frequently utilize this potential. I claim that this expansion of intervals is a conversational implicature based on default assumptions about the predicate. First, let us recall that the expansion of intervals occurs only when there is another salient interval close to them. Moreover, recall that activity predicates with a short duration tend not to show the neutralization. Then, one plausible hypothesis is that there is a characteristic implicature with atelic predicates such that we assume an atelic state of affairs to continue at least for a while, unless otherwise specified. This hypothesis is consistent with the fact that the neutralization occurs more readily with activity predicates with a longer duration than ones with a shorter one, since our assumption of a continued state of affairs will be weakened for the latter. Moreover, this position is supported by the cancellable nature of the implicature. Consider (51) and (52), which are exactly like (7) and (8) above in that they describe the same situation even though they have different tenses:

(51) Mary-ka aphu-ϕ-ul ttay John-i yenayphyenci-lul
Mary-Nom sick-Incom-Rel time John-Nom loveletter-Acc

hanthong ssu-ess-ta.
one unit write-Compl-Dec
'John wrote a love letter when Mary was sick.'

(52) Mary-ka aphu-ess-ul ttay John-i yenayphyenci-lul
Mary-Nom sick-Compl-Rel time John-Nom loveletter-Acc

hanthong ssu-ess-ta.
one unit write-Compl-Dec
'John wrote a love letter when Mary was sick.'

(51) is bad but (52) is good with the continuation (53) in a context where John spent a long time writing the letter.

(53) Kulentey, phyenci-lul keuy kkethnay-ul cuum Mary-ka aphu-ci
however letter-Acc almost finish-Rel time Mary-Nom sick-Inf

anhkey toy-ess-ta.
not become-Compl-Dec

'However, Mary became not sick by the time he almost finished writing the letter.'

This result is borne out in our analysis: (i) (51) and (53) are a contradictory sequence of sentences given their truthconditions, while (52) and (53) are compatible. In particular, it is specified in (53) to exclude the common implicature based on the nature of the atelic predicate.

However, this kind of implicature is not available for telic predicates. Dowty showed explicitly that the definition in (50c) excludes the possibility that a telic sentence true at i can be true at i', a superinterval of i. The logic is simple. Let us take the example in (54) and suppose that it is true at i. Also suppose it is true at i', a superinterval of i.

(54) John built a house

Now we have the telic sentence in (54) true at i', and it is also true at i, a subinterval of i'. This contradicts the definition of telic predicates in (50c). By *reductio ad absurdum*, (54) cannot be true at i', if it is true at i.

4 Conclusion

Investigating time adverials in Korean, which exhibit apparent partial relativity in tense, we have explained why they apprear to be partial in relativity. It has been also shown why atelic predicates are correlated with this partiality. Given that the facts in time adverbials are consistent with the general relativity of tense in Korean, we maintain that Korean is still a strictly relative tense language.

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